THE HEALTH SERIES

OF

PHYSIOLOGY AND HYGIENE

HEALTH AND CLEANLINESS

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HEALTH HABITS

HEALTH AND CLEANLINESS

THE BODY IN HEALTH

MAKING THE MOST OF LIFE

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HEALTH AND CLEANLINESS

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INTRODUCTION

It is the aim in "The Health Series of Physiology and Hygiene" to present in an attractive form for pupils in the elementary school the latest and most accurate knowledge relating to physiology, and especially to the hygiene of daily life. The constant effort of the authors has been to make scientific knowledge so simple, so concrete, and so captivating that pupils can hardly fail to take an interest in the problems of preserving health for the purpose of making the most of life.

Throughout the series, the aim has been kept in view of awakening in the young a normal desire to live in such a manner as to develop strength and preserve health, because in this way the individual will have the greatest success in securing the things which he desires, and in avoiding the disabilities and pains which otherwise are likely to occupy a considerable part of his life. Comparatively little attention is given to anatomy, and only sufficient physiology is presented to constitute a basis for the facts of health which are discussed.

Very extensive use is made of photographs and diagrams illustrating every-day life in the city and in the country. There is at least one interesting and practical original exercise suggested for every principle of health presented

in any lesson, and it is the plan that each pupil should work out each exercise and report upon it during the recitation period. In order further to assist the teacher and the pupil, a list of questions, fully covering the text, has been given at the end of each chapter.

PREFACE

In the first book of the "Health Series of Physiology and Hygiene" it was the aim to lead the child to acquire healthful habits in respect to his work, his study, his sleep, his manner of walking, sitting, eating, the care of his body, his clothing, the things he uses in his work and his play, and so on.

In this book it is the aim to lead pupils to see the dependence of health upon protection against infection of one kind or another and to arouse in them active, aggressive feelings in regard to keeping themselves and everything about them clean as a safeguard against infection. In a simple, concrete way the pupil is made familiar with germ life and the conditions under which it can be controlled. Then he is led to see what is likely to happen to people who live in homes or schoolrooms that are not kept clean and free from dust; who use milk or water or food of any kind that is contaminated; who are careless in regard to the cleanliness of their hands, face, teeth, clothing, and so on; who do not take pains to see that there is an abundance of sunlight in their homes; who live in towns or cities in which filth accumulates on the streets and in which there are no efficient laws in regard to sanitation; and so on through many other topics of interest and practical importance in the pupil's every-day life.

Particular pains have been taken to make the child see that he should live in such a way as to keep his body in a vigorous condition so that it can resist the germs that, if they find lodgment in any of his organs, will cause sickness and possibly death.

How contagious diseases are spread and how they must be controlled are adequately treated. Special stress has been laid upon a discussion of the various poisons, — alcohol, nicotine, caffein, etc., — which weaken the defenses of the body against infection.

All these matters are presented in simple language and a lively style; and every important fact of health is illustrated by a photograph or appropriate drawing. Marginal headings are freely used to assist pupil and teacher; a number of original exercises are suggested for each subject treated; there are detailed lists of review questions appended to each chapter; and a pronouncing vocabulary and an index will be found at the end of the book.

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HEALTH AND CLEANLINESS

PEOPLE AS WELL AS PLANTS CAN BE STRONG AND WELL ONLY WHEN THEIR SURROUNDINGS ARE CLEAN.

HEALTH AND CLEANLINESS

CHAPTER I

What it Means to be Clean

An eminent physician being asked, "What most helps to keep people well?" replied in a single word — "*Cleanliness.*" That word means a great deal, for cleanliness is the first law of health. **Cleanliness.**

To be clean is to be free from dirt of every sort. Now, you can readily see the dirt on your shoes after you have been walking in mud; but it is not so easy to see dust when it spoils the air you must breathe. Dirt that cannot be seen is to be shunned just as much and perhaps even more than dirt that can be seen. **The first law of health.**

I suppose you will wonder how one can avoid dirt which cannot be seen Men of science have long studied the effects upon health of dirt of this sort, and have told us so much about it, that it is now pretty well understood where such dirt is likely to be found. If we can find out how to detect it, we can keep away from it, or get rid of it.

Often there are odors about a place or a thing which indicate to one whether or not it is clean. Some day

when your mother or the laundress brings in the freshly-dried clean clothes, just notice how they smell. Describe the smell. You could tell with your eyes shut that these articles are clean. You could have told by their odor before they were washed, too, that they were not clean. How? Is it best for one to use both his eyes and his nose to detect dirt? Why?

Dirt, the cause of much disease.

Many hundreds of years ago, people had not learned much about the necessity for cleanliness. The houses in which they lived had no means of ventilation. The ground served them for a floor. To make the ground soft to walk upon, it was covered with rushes. Every few days fresh rushes were put on over the old ones, and the latter simply rotted and molded. It was the custom then to eat with the fingers, and to throw the bones on the floor under the table for the cats and dogs. With the dirt made indoors added to that brought in from the out-of-doors, filth was everwhere abundant. Refuse and slops were thrown out upon the ground or into the street gutters. Clothing was seldom changed, nor were undergarments worn. A soap-water bath was looked upon as almost dangerous. What should you expect from such a condition of affairs?

With such a state of uncleanness, it often happened that the people became smitten with some dreadful sickness or *plague*. At one time, about one-fourth of the population of Great Britain died from

such a plague. At another time, a deadly disease became so common in the great city of London that it was feared there would not be a well person left in the place. And there might not have been, if a terrible fire had not burned up the filth by destroying the houses on over four hundred streets. Dirt and disease are such fast friends that a similar plague might occur at any time and in any place where there is such a great deal of filth.

Dirt, you know, is the soil in which plants grow. Some plants are ugly, and others are most beautiful; some have lovely flowers, and others are only weeds. Some are green plants, and others are colorless. Both kinds breathe and eat in their way, but they use different kinds of food. The green plants draw their food from the air, the earth, and the water. Colorless plants live upon the material of dead plants and animals. Some very, very small kinds of colorless plants grow in dirt. They are such tiny forms of life they can be seen only with a microscope. Because they are so small they are known as *micro-organisms* or *microbes* (meaning small life).

The growth of microbes.

They are often spoken of as *germs*, which mean *first beginnings of life*. More often, perhaps, they are called by special names, as *bacteria*, *yeasts*, or *molds*. By whatever name they are known, they are the *smallest* and *most numerous* of all forms of life. Should you expect to find them in dirt? Why?

When, in wet weather, one brings mud on his shoes into the house, does he bring any microbes along with it? When the warm sun dries the dirt on the ground or in the streets into dust, and the wind blows it about everywhere, what happens to the microbes that are in it? Their seeds, or *spores* as they are called, cling to the atoms of dust. In this way they become scattered abroad everywhere outdoors and indoors. So long as they remain dry they do not grow, any more than would seeds of the morning-glory vine spread upon a plate in the sunshine. What then is necessary for their growth?

GERMS HAVE DIFFERENT FORMS. HERE ARE THREE FORMS — SPHERES, RODS, AND SPIRALS. THIS IS THE WAY THEY LOOK UNDER THE MICROSCOPE.

A curious thing about these microbes is that they can grow in a great many other soils beside garden dirt. In order to thrive best they must have:

1, Food; 2, moisture; 3, warmth; 4, more or less of darkness.

When once they touch something that happens to supply all these needs, they grow and multiply so fast that one cannot keep count of them.

A microbe, if there were food enough for it to feed on and conditions favorable for growth, might produce more than two hundred and fifty billion microbes in one day. A microbe is so small it could do no great harm if it were not for its very rapid growth.

How many microbes do you think this boy is carrying into his house on his muddy shoes?

There are a good many kinds of these tiny germs. Fortunately most of them do us no harm. Many of them are really our helpers, because they feed on harmful germs and destroy them. Certain ones are the cause of such diseases as *tuberculosis*, *typhoid*, *diphtheria*

and other deadly ills. How should we treat these kinds? We cannot see them, so about our only way to avoid them is to shun the places where they are likely to be found. We know they grow in dirt. We know they are likely to thrive in dirty corners, on dirty clothes, and in dirty places. Our safest course is to keep all the things we have anything to do with very clean.

To begin with oneself, — clean teeth, a clean skin, clean hands, and particularly clean finger nails are first to be thought about. Is it equally desirable to wear clean clothes? Why? Soiled garments never seem suited to a clean body.

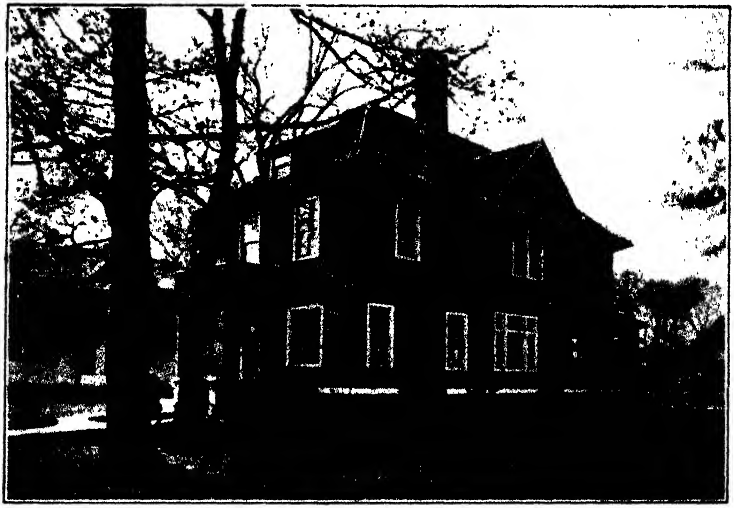
When thus clean, do you imagine one would like to go to school in a dusty, dirty, stuffy room? Why not? Houses need to be clean as well as one's person. Why? A clean-kept house with a clean yard around it is likely to be a safe place in which to live. Do you think it makes any difference whether the house is a home, a schoolhouse, a store, or a shop?

Protection from harmful germs.

Clean habits, clean places in which to live, clean air, clean food, and clean water are each a link of a chain. If one lives in a town, — clean streets, clean yards, clean cars, and clean parks are other links.

Sometimes it happens that a person takes great pains to keep clean because he loves cleanliness and wants to keep well, and yet he gets sick because other people are careless.

Things around and about us need to be clean. Clean neighbors are likewise important. Filth in someone else's back yard may be as great a source of danger to us as though it were on our own ground. It may do us even more harm. If it were on our own premises,



A HEALTHFUL PLACE FOR A HOME IN A CLEAN NEIGHBORHOOD.

we could clean it up. But can we always get our neighbors to keep their places clean? Ought they to do so?

I asked little Helen, who is a tidy child and loves to have everything clean, what she thought one should do if he had neighbors who were careless and untidy? "Move to some place where the people are cleaner," was her answer.

But that might not be convenient. Besides, it would not cure the neighbor of his dirty habits. Other people would still suffer on account of his neglect. Then, too, on some windy day when the germs were out for a frolicsome ride on their dust aeroplanes, they might fly even as far as our better neighborhood, and stop there for a visit. Do you think you would enjoy a visit of this sort? Why?

Cleanliness of body and of home.

There is a tale of a ragged, dirty, and careless child who by chance one day passed the beautiful statue of a Greek slave girl which stood in a market place. Struck by its beauty, she gazed at it in rapture for a time, and then went to her home, washed her soiled face and hands, and combed out her tangled hair. The second time she studied the beautiful figure she went home to mend and wash her clothes. Again and again she visited the place to look upon the beauty of the statue, each time going home to add some touch of grace to her own life.

Do you not think if the careless neighbor were to see clean, well-kept back yards next to his own, it might open his eyes to the beauty of cleanliness, and make him ashamed to have a dirty yard himself? Do you have clubs in your city that try to keep the streets and back yards clean? Do you have cleaning-up days?

Cleanliness in ways of living would save many human lives every day in our country. Thirty-five

thousand people in the United States are each year killed by the disease known as typhoid. This is a filth disease. It is nearly always caused by swallowing typhoid germs in food or drink. Clean food and clean water would save these lives. But this is not all. Other diseases due to dirt in some form destroy thou-

AN UNCLEAN YARD IN A NEIGHBORHOOD THAT NEEDS CLEANING UP.

sands upon thousands of persons every year. Then there are all the cases of illness that do not prove fatal. Add to each of these the cost, the pain, and the discomfort the diseases bring. Do you not think we should do everything we can to keep clean? Does it seem worth all it will cost to get rid of dirt?

Have you ever taken a walk on a fine summer morning along the banks of a brook where those beautiful fish, the trout, sport and play? If so, you have no doubt noticed that the fish that live among the rocks and shadows of trees are so dark in color you often have to look twice in

Cleanliness of town or city.

FISH IN A STREAM ARE COLORED DIFFERENTLY ACCORDING AS THEY LIVE IN THE SHADOWS OF ROCKS OR TREES, OR IN THE SUNLIGHT.

order to see them. Those that dart about the brook where it flows through the open fields in the sunshine are of a lighter color. We are told that trout take their color from the waters in which they live.

You often hear people speak of *sanitation*. It means

keeping clean. It is the sum of all the single clean habits and clean things in one's environments, just as 24 is the sum of $2 + 4 + 5 + 6 + 3 + 2 + 2$. Sanitation is a most necessary matter for every city and town, and for every home, school, or business house that helps to make up that city or town. Do you think it is as necessary for houses and premises in the country as in the city? Why?

REMEMBER: Our health takes its color in a way from that which surrounds us, or, as it is termed, from our *environments*. If these are clean and healthful, they help to keep us well. Our clothing, our bed, the study room, our playground, our house, its back yard, the streets we walk, — these are all among our environments, and must be kept clean for health.

CLEANLINESS IS THE FIRST LAW OF HEALTH.

HEALTH PROBLEMS

1. Write a composition of about one hundred words telling why cleanliness is necessary for good health. Do not waste words; make every one count in showing why dirt is bad for health.

2. Are the eyes better detectives of dirt than the nose?

Whatever your answer may be, you should be prepared to give reasons.

3. Why do you think the people who lived long ago were dirty in their habits? Are there any such people living to-day?

4. How did people learn that in order to keep well they must keep clean both in their homes and outside?

5. Mention plants that get their food from air, earth, and water.

6. How can one tell that there are such things as *germs* or *microbes?*

7. Why do you think the *spores* of *microbes* cling to atoms of dust?

8. Why do people like to have those about them clean?

9. If you live in the city, what sorts of places that you see are most unclean? Could they be kept clean? How?

10. Is it as easy to keep our homes and environments clean in the city as in the country?

Review Questions

1. What does it mean to be clean?

2. Are there some kinds of dirt that cannot be seen?

3. How can one detect dirt that cannot be seen?

4. Should we avoid dirt that cannot be seen as well as the other kind? Why?

5. How can one tell from odors whether a place is clean or not?

6. Did the people in olden times appreciate the necessity of keeping clean? Why?

7. Tell about the ventilation in ancient houses.

8. What did the people in those early times do with the refuse from the table?

9. What should we say of a person who disposed of refuse in that way to-day?

10. What happened to the early people because they had so little regard for cleanliness?

11. What name is given to the living things so small that they cannot be seen with the eye alone?

12. What happens when mud is brought into the house, or dried dirt from the street is blown into the house?

13. Under what conditions will microbes grow best?

14. Are all germs harmful to people?

15. What precaution should one take to secure pure milk and pure water?

16. Mention the various things which influence one's health.

17. What does *sanitation* mean?

CHAPTER II

Health in the City

Bad housing and its effects.

If you have never been in the crowded portion of a great city, you may find it hard to believe that hundreds of human beings, many of them boys and girls no older than yourselves, live in homes where walls shut out the sunshine and air, so that even if they keep their windows open, they do not get air pure enough to make them strong and vigorous and able to resist disease. In many cases there are rooms or *tenements*, as they are called, without any windows. Often people both live and work in cellar rooms that lack sunlight and fresh air completely.

In the beginning, a city is but a small collection of buildings. Land is plentiful enough to provide for ample sun and air space for every house, store, factory, shop, and so on. But as the city grows, and its business increases, the land near the center of things gets very scarce and very valuable. Generally there is land enough farther out, but that would not be so convenient for business. To make the greatest possible use, then, of each small area of land, houses are

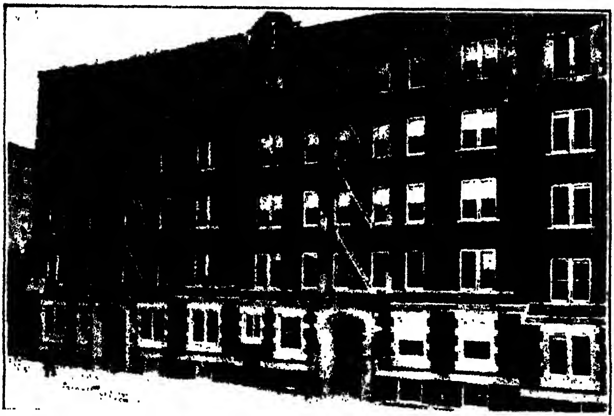
built in solid blocks, — five, eight, twelve and even twenty stories high. This seems quite like building a row of houses one on the top of another, instead of alongside each other on the ground.

It is possible in these high buildings to provide a great amount of room, and it can be made just as good as ground room, but it is not usually made so. Of course, people who live in the higher stories of a "sky scraper" have more dangers to meet in case of fires than those who live on the first floor; but they really ought to get purer air than those who live lower down, because they are above the range of the street dust. It frequently happens, though, that only the apartments at the front and back of such blocks have windows open to the out-of-doors. Some rooms have windows opening into other rooms which have outside windows; some have windows opening into a small space between buildings called an "air shaft";

WHEN CITIES BECOME LARGE, GREAT BUILDINGS MAY BE PUT UP NEXT TO ONE'S HOUSE, AND SHUT OUT THE AIR AND SUNLIGHT.

and some have no windows at all. If the dark rooms were used for ware or storage rooms, or for business purposes so that they would be used but a few hours a day, it would not be a serious matter. But a good many such rooms in most cities serve as living places for men, women, and children. Many working people in a city

Insufficient air, light, and space.



Perhaps 500 people live in this one building. It is much better, though, than most tenement buildings.

are not able to own their homes. So they must rent living places for themselves and their families. Of course, they wish to dwell near their work.

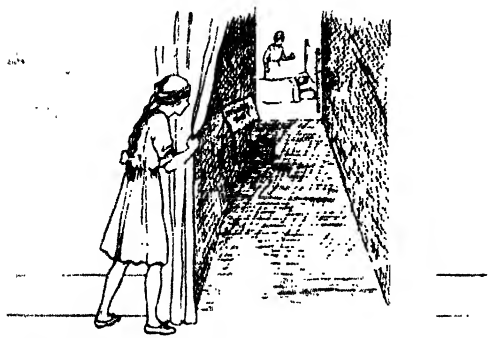
The people who build these great buildings divide up each floor into tenements of one or more rooms, and rent them for lodgings. In some buildings of this sort,

more people than you could imagine find shelter and a place to eat and to sleep. If you were to make a tour of one small street in a certain part of the city of New York, you would find on either side tall tenements like high boxes of brick. Over the front of their five stories spreads a network of iron fire escapes. From the windows in the rear runs a mesh of clothes lines. There are no trees for shade and no patches of green lawn about these buildings. Each of the buildings shelters no less than 500 human beings. If you were to enter one of the open doorways, you would probably find yourself in a passage of almost pitchy darkness, even though the sun were shining outside. Perhaps at one side you would notice a filthy sink where the tenants of the floor get their water. Only about one in four of the rooms in such a building receives any sunlight. Do you wonder that these sunless homes are often dingy and dirty? Do you think it is strange that those who live in such places are likely to be sick much of the time?

Most cities have special laws regarding the size of rooms and apartments to be rented. The "housing law" of New York provides that in every apartment there shall be at least one room with as much as 120 square feet of floor space. No room can have less than 70 square feet and all must be at least nine feet high. Then, too, there must be allowed for each person above twelve years of age 400 cubic feet of air space, and at least 200 cubic feet for each younger

person. Suppose you find out from these figures how many persons may safely occupy a two-room apartment of the ordinary size.

Will it surprise you to learn that in very many instances from three to six individuals dwell together in one small room, and that two rooms often serve as the home of a man, his wife, and four or more children? What chance will children who have only one-sixth of the air of two small rooms have to avoid becoming puny and sickly? The thing that actually saves many of their lives, no doubt, is the time they spend in the streets out of doors. Even then the number of little children who die of pneumonia in such a neighborhood is three times greater than that of children who live in cleaner and more airy homes. The overcrowding of people in poor living places always swells the number of victims of those dread house diseases, — tuberculosis and pneumonia. Do these statements surprise you? Why?



No sunlight in a home usually leads to a sick-bed.

Suppose some of the people in these disease-breeding

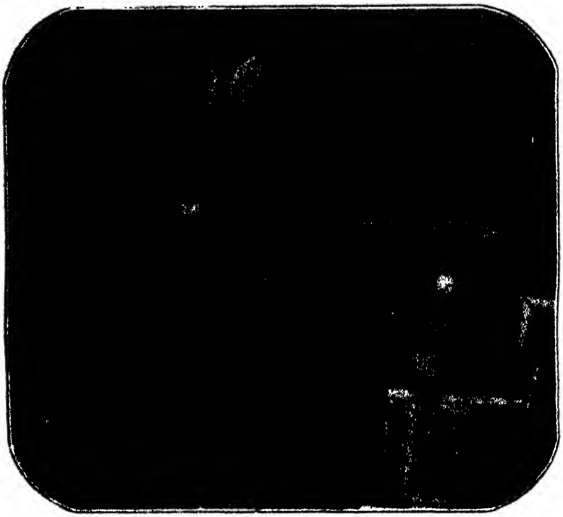
places are ill with tuberculosis. Suppose, too, that right there in their homes they are at work picking out nutmeats for some dealer, or making clothing for some shop, or stuffing dolls, or doing any of the various other things by which they earn their living. Do you think the people who buy those shelled nuts and garments,

How tenement dwellers spread disease.

HOW MUCH MORE FORTUNATE THESE CHILDREN ARE THAN THOSE WHOSE ONLY PLAYGROUND IS A DINGY TENEMENT ROOM!

or the babies who play with the lovely dolls, though living hundreds of miles away from those gloomy city tenements, would be safe from the germs of tuberculosis? Of course, they would not know their danger, but that would make no difference to the germs. So that whether one lives near to these tene-

ment dwellers, or far away from them, he ought to be interested in having their condition bettered, for his own health and that of his friends may depend on the conditions in those tenements.



THERE IS NOT EVEN ONE WINDOW IN THIS TENEMENT ROOM, THE HOME OF SEVERAL PEOPLE

Here is a more pleasant account: Several years ago a company of gentlemen secured the lease of a section of New York tenement houses in which two hundred and forty-four families lived. The houses were mostly poor and untidy quarters. The neighborhood was known by the police as one where lawbreakers were likely

How tenements have been made healthful, attractive places.

to find a refuge. The landlords had long despaired of keeping up the plumbing. Some one was always stealing the faucets and carrying off the lead piping. Even the stair railings had been torn off and used by the tenants as weapons or firewood. The first thing the company did was to put the buildings in good repair. Then the tenants were told that quarrelsome people would not be permitted to live in them, and that no family could have a home there whose children were found carrying liquor in and out. A play room was arranged for the children. A laundry was fitted up for general use, and lessons in sewing were given to the women and girls. The tenants were glad to have cleaner, better buildings; and naturally they were careful to do as they were required.

At the end of two years, all but four of the tenants still retained their homes there. Mark what else happened. Formerly, *seventy-five out of every one hundred of the little children of these families died before they reached the age of five years. But at the end of the two years in the better environment, the death rate had been reduced to thirty out of every hundred.* Was it worth while to save so many children's lives by surrounding them with better conditions in which to live?

This experiment made it plain that in order to improve the health of the poor working people, they must be better housed than they had been. In 1902, the city government of New York created a Tenement House Department. Laws regulating buildings to be

used as homes were passed, and a number of inspectors were set to work. Then began many changes for the better. Since then, hundreds of tenements have been built over and made more fit to live in. Light and air have been let into thousands of dark rooms. When new buildings are put up for housing, their owners are now bound by law to provide good lighting, ventilation, sanitary conveniences, and fire protection. Some of them do more than this, and supply meeting rooms for the grown-up population, and kindergarten rooms and roof gardens for the children.

But this good work has only begun. In 1911, somewhere amidst the one hundred thousand tenement houses of Greater New York, there still lurked ninety thousand dark rooms without windows or means of ventilation. There was a population vast enough to form a small army in these dark rooms. The unfortunate families who dwell in these cave-like tenements are generally the very poor, who, in order to increase their meager earnings, take in other poor people as roomers, until in some cases as many as eight individuals herd together in one small, close room. Is it any wonder that in the foul atmosphere of such a place, the grown people become sick, and the babies and children die?

The way they do in England.

In order to make their working people comfortable, the cities of London and Liverpool, England, have torn down many blocks, and in their places have put well-lighted, well-ventilated, and well-drained houses, providing each tenant family

with four or five suitable rooms. Only three-story buildings are allowed. A grass plot at the front of each tenement is the rule. Space at the back is devoted to small gardens, or sometimes to a playground. Do you think lower buildings and wider streets would help to provide purer air and more sunlight for those who dwell in American cities?

If you have a chance to do so some summer day, you should visit the Phipps Tenement House of New York. You will find there a model place for city dwellers. The yellow brick building has an air of homelikeness even from the outside, where window boxes with hanging vines adorn the walls. You may enter the door, and pass up the well-lighted stairway. Every step and every corner is clean and tidy. No rubbish can be seen, — not even a scrap of paper. Neither are the pretty green-tinted walls covered with pencil marks or anything of the sort. Apartments of two homelike rooms have shower baths; and those with more rooms are provided with bathtubs. There are closets, hot and cold water, and gas and steam heat throughout the building. The basement has a laundry and dryers free for the tenants. Upon the roof is a garden with growing plants and flowers, and a concrete fountain of shallow depth in which the children can play without harm. Why are the people who dwell in these light, homelike places more likely to be better citizens than those who live in the dingy tenements?

Plenty of parks and playgrounds convenient to the homes of the people would enable the city dweller to get light and air most of the year. Extensive and beautiful parks exist in nearly all cities; but, unfortunately, they are often too far away for general use

THERE SHOULD BE PLENTY OF PARKS IN EVERY CITY SO THAT ALL THE PEOPLE MAY ENJOY THEM.

by those whose daily toil leaves them but little time for recreation and outdoor life. But where no land is available, there may be acres of roofs which with little expense could be made into gardens and open-air resting places.

A single individual living alone on some island might

pursue "his own course" in matters that have to do with health. If he chose to live amid filthy surroundings, to eat bad food, or otherwise injure his health, he alone would suffer the consequences. But where even two or three people live together, as in a family; or where several families dwell near together, as in a neighborhood or community, do you not think each person is in duty bound to conduct himself with due regard to the welfare of his fellow beings?

No one lives to himself alone.

One careless person through neglect may be the cause of a world of harm. If the person whose duty it is to look after the food supplies in a home fails to take pains to keep them clean and in good condition, the whole family may be made sick by eating them. In just the same way, though on a larger scale, the butcher, the baker, the market man, the ice cream vender, the candy dealer, the milkman, or any one else who supplies people with things to eat or to drink, may through lack of care do very great harm. The privilege of doing for other people carries with it a duty to do what is right. Many people see to it that no person shall be injured in health by any act or deed of theirs. There are others who pay no attention to this.

To protect its inhabitants against such heedless persons, most towns and cities have a code of rules to govern matters that have to do with health. Some of these matters are the proper care of garbage, spitting

on sidewalks, overcrowding in houses, taking precaution against the spread of disease, seeing that the water supply is pure, and so on. It is customary for

One of these boys lives in a crowded tenement, the other in an airy house near a large open space. Which is the tenement boy?

each town or city to appoint one or more health officers to teach those who do not know what the laws of health are, and to see that the health rules are lived up to. All the states have boards of health, and

many large cities also have boards of health. In the city of Chicago there are hundreds of health talks given in all parts of the city every year, and a great deal is printed on the subject and given to the people. In some states a health exhibit train, carrying models and pictures with persons to explain them, makes tours for the purpose of instructing people in health.

Japan is a small country, but its government is wise in dealing with matters of health. In 1902, when war broke out with Russia, the Japanese people knew very well that their enemy could put on the field more than twice as large an army as they could raise. Another thing they knew, - that wherever large numbers of people live in crowds together in either a city or a camp, unless the utmost care is taken in regard to all things relating to health, there is sure to be sickness and loss of life. They knew that often in war four times as many soldiers die from camp diseases as are killed in battle; and they determined to save their soldiers by keeping them well.

They appointed special officers to guard the health of their army. These men saw to it that the food was kept clean, and served clean; that none but wholesome drinking water was used; that flies were screened out, and all wastes properly taken care of. They taught the soldiers to look out for their health. So faithfully did they do their part, and so well did the soldiers obey the rules laid down for them, that scarcely a

fourth of the lives lost in all that war were due to sickness. The men kept in such good health that nearly all those who were wounded in battle got well again. What these wise Japanese were able to do in preserving the health of their men, could not any country, state, city, or town do to keep its citizens in health?

Of course, had the Japanese soldiers not been willing to carry out the directions their health officers gave them, there would, no doubt, have been a great loss of men by sickness.

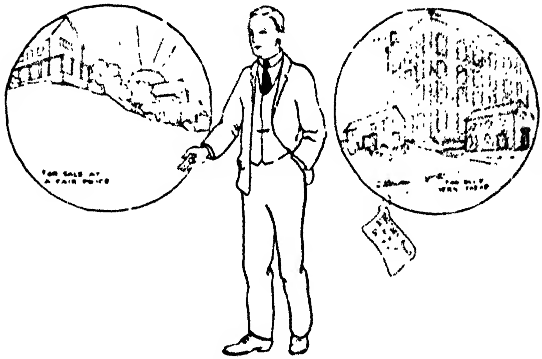
Quite often people do not like to submit to health rules; but is it right that they should refuse to do so? All good citizens will seek to promote the health of their own towns. They will be willing and ready to stand by the health officers in their work. Boys, and girls, too, can aid in various ways in keeping their home town clean and healthy. They can at least remember not to spit upon the sidewalks, and not to throw fruit skins, stones, banana peels, and apple cores about their home or school grounds.

How the children of one city cleaned it.

One day last spring, the children of a good-sized city were seen going to and fro in every direction, carrying baskets and old sacks. Some were seen driving a horse and wagon. Do you know what they were doing? They were carrying away the waste paper, old tin cans, pop corn bags, crackerjack boxes, and other rubbish they were gathering from streets and vacant lots.

These children had undertaken to "clean up" their city.

From nine o'clock in the morning till five in the afternoon they were as busy as bees, — too busy even to stop and watch a fire when the gong sounded, and the engines rushed by The boy who did the most had to his credit at the close of the day more than



WHICH SHOULD HE BUY? WHY?

one hundred bushels of rubbish, and the total for the whole city was thirty thousand bushels.

REMEMBER: Homes with plenty of light and air, clean streets shaded by trees, air free from smoke and dust, wholesome dwellings and working places, ample spaces for play and rest, — all count for a good deal in the making of a city and its citizens, and in helping them to keep strong and happy. Every person, whether young or old, should help to make his city a healthful place in which to live.

Health Problems

1. Is there a housing law in your city? If so, find out just what the law is. Be ready to tell the class whether it is a good law, and if carried out whether it would secure light and air enough for all the people in the city.

2. Find out from your health officer, or some one else, in what parts of your city or town tuberculosis or pneumonia are most common. See if you can explain the facts.

3. Are there any model tenements in your community? If so, describe the provisions which are made for light, air, and cleanliness.

4. How does your community try to spread knowledge of health among all the people? See if you can find out all the ways in which this is done, and tell whether you think they are really helpful.

5. Would it be a good thing for every community to have "cleaning-up days" quite frequently? If you live in the country, would it be a good thing to have a "cleaning-up" day around the house and barn and school building at least once every two weeks?

Review Questions

1. What sort of buildings are *tenement* houses? Where are they usually found?

2. Do people ever have to live in homes in which they get almost no sunshine or air? Why?

3. Why do people build blocks fifteen or twenty stories high? Is there any reason why one should not live upon the highest floor?

4. How many people often live in one small room in a crowded tenement of a great city?

5. Tell about the "housing law" in New York.

6. What diseases are very frequent in crowded tenements where there is not enough light and air?

7. How are diseases likely to be spread throughout the city from tenement rooms in a large city?

8. What has been done in London and Liverpool to improve the conditions in tenement houses?

9. What should you see if you could visit the Phipps Tenement House in New York?

10. But what must people do in regard to health if they live close to other people in neighborhoods?

11. How may one person careless in health cause others a great deal of harm?

12. What sort of people in a neighborhood have to take special pains to protect the health of the community?

13. Why do most towns and cities have a code of laws to govern matters having to do with health?

14. How does the community see that the health laws are lived up to?

15. What is done in the city of Chicago to spread knowledge of health among people?

16. What is meant by "cleaning-up" days in a city? Should every community have such days? Why?

CHAPTER III

Health in the Country

Quite often we hear it said that the country is a more healthful place in which to live than the city.

Advantages of the country over the city.

Do you think this is always so? It is true that in the country one may breathe air made clean by blowing over woodlands, fresh fields of growing grass and grain, and clean white snow; he may if he wishes have plenty of sunshine, open spaces, and pure water. But you know that one can pollute the air and water and make his home and its surroundings just as unhealthful in the country as in the city.

A country home situated away from the highway dust, surrounded by clean, well-kept premises, and supplied with pure water is surely a more healthful home than one in the crowded quarters of most cities.

One way to determine the healthfulness of a community is by finding out the number of deaths occurring in each 1000 of its population. Wherever this "death rate," as it is called, is lowest is considered the healthiest place in which to live. This, of course, is not an altogether sure method, because a great

many sick persons get well. By comparing the death rate in the city and in the country, it has been found that more people die from pneumonia, tuberculosis, and most of the catching diseases in the former than in the latter. What do you think is the reason for this? On the other hand, more country people and

AIR THAT BLOWS OVER A FIELD LIKE THIS WILL BE SWEET AND PURE.

dwellers in small towns get typhoid than those who live in large cities. Now, you may remember that bad water is one of the chief causes of this disease. In cities the health board watches to keep the water supply safe. In the country, each farmer provides his own supply, and often it comes from a dug well into which all manner of impurities may drain when it is not properly

located. Then the typhoid fly is likely to be more numerous in the country than in the city because of more favorable breeding places.

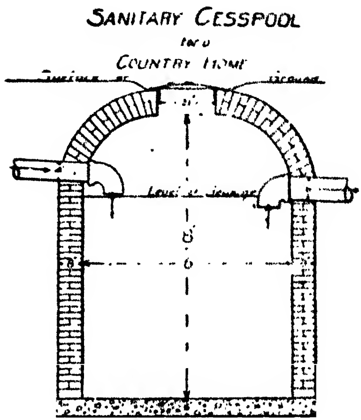
Disadvantages of the country.

The house on a farm is often the center of a circle of buildings, — barns, chicken house, sheds, and pens in which are kept horses, cattle, sheep, pigs, and poultry. So it happens that, even though no other people dwell very near, the farm homestead is a sort of colony of living creatures, each helping in some measure to defile the air and pollute the soil about the house. Then, too, the farmer brings the farm produce, — the hay, the grain, the vegetables, and fruits from the outlying fields to the vicinity of the house for storage. Some of this he sells, some he keeps for his household, and some is fed out to his stock and fowls. If he is a careless person, quite likely he throws this foodstuff on the ground. Then what the animals and birds do not eat gets trampled under foot to ferment and rot in the dirt.

The sewage system of a town or city usually disposes of its organic waste in some manner. The farm community has no such provision. Ordinarily the household waste as well as that from the barns, which are often as densely populated with animals as are city tenements with people, is left on or near the ground surface, although there are sanitary ways by which it may be easily taken care of.

With no means provided for the outflow of the foul fluids that soak into the ground from manure heaps,

earth closets, and cesspools, all the near-by soil becomes saturated with filth and bacteria, and, as sometimes happens, with the eggs of harmful parasites. With such a soil you can see how easily the water in the shallow well may become impure. Every rain may wash the filth a little deeper down until it reaches the well itself, or the underground vein by which the well is fed.



THE SEWAGE MUST SEEP THROUGH EARTH AND GRAVEL, AND SO IT IS PURIFIED.

Wherever one lives, whether in the city or in the country, it is most important to have clean soil around one's dwelling. In warm countries like Italy and Porto Rico, and even in some of our own southern states, there is a most troublesome and serious malady known as the hookworm disease, that comes from soil pollution by human beings. For years the people suffered with it, not even knowing its cause. Those who had it, and there were often many entire families and even entire communities afflicted with it, felt too ill to work, and people called them shiftless. Children sick with it become pale, sallow, and bloated, and do not grow properly. A boy of eighteen, ill with the disease, may be no

The hookworm disease.

larger than a normal child of ten should be. He is likely not to be active like a well lad, and he may care little about exercise or play. His mind, too, may fail to develop; and if he goes to school, he will be backward, and far behind his class. He may not die with the disease; but if he is not cured and continues to live he will always remain a dwarf in both body and mind.

THE HOOKWORM. IT THRIVES IN FILTHY COUNTRY PLACES IN WARM COUNTRIES.

Within the last few years, investigations carried on by Doctor Charles Wardell Stiles, of the Government Public Health Service, have revealed the cause of this disease which afflicts two million people in our southern states, to be a tiny worm no larger than a bit of sewing thread, and less than a half inch long. This tiny creature is called a hookworm, because of the way it does its mischief. It hooks itself by its mouth to the inside lining of the intestines, there to poison and suck the blood of its victim. It enters the human body while still in its larva form, sometimes in a drink of bad water and sometimes on unwashed vegetables and fruits eaten raw, but more commonly through the skin of the hand or foot. The soil in many places is fairly alive with these larvæ. Children run over the ground with bare feet or play in the dirt with their hands, and the larvæ fasten on to them. They bore

their way through the skin and work up past the heart and the lungs, until they reach the windpipe. Thence they follow the food through the stomach into the intestines, which is the goal of their journey.

Hookworms do not multiply in the body, although they lay many eggs. These, discharged with the body waste, may in one way or another get into the soil, and there in a few hours they may develop into larvæ, waiting for a chance to attack some victim. Very many of the people where the hookworm thrives are too poor to buy shoes; and with the ground around every dwelling house and every schoolhouse swarming with the larvæ, no barefoot person could escape them. So it is no wonder that until recently nearly everybody had hookworm disease, with its resulting evils.

When the cause of this dreadful scourge became known, Mr. John D. Rockefeller made a gift of a million dollars to be used to cure the afflicted people, and to rid the country of the disease. A certain treatment was found, which when properly given, cures the illness; but the chief thing to do is to prevent the people from getting it at all, by teaching them to keep the soil clean. This work has begun in earnest, and the hookworm disease is now being rooted out.

In all these things about which we have been talking, you see that cleanliness is one of the first needs in promoting health in the country as well as in the city. Many who live in the open country take great care in this respect. No domestic animals are allowed

about the house and grounds, and the animal quarters are kept very clean. Deep wells furnish the drinking water, and good sanitary conditions afford protection from disease.

Country houses often lack light and air.

It is strange that people will live in crowded quarters in the country, where there is plenty of room for every one, yet overcrowding is not uncommon. Badly built houses, with few and small windows, in which several people live, make bad air. In winter time even these few windows may be nailed shut in order to save fuel. Thus people may starve for fresh air inside the country house, while everywhere outside there is an abundance of it. It takes healthful living conditions and

Even houses in the country may be dark and dingy. There is only one window in the upper story of this country house.

health habits to make good health the accompaniment of life in the country.

People sometimes object to living in the country on account of being so far from neighbors, and because they think opportunities for entertainment and culture are fewer. This does not need to be the case. Dwellers in country districts can, if they choose, surround themselves with advantages equal to those in town life, and in addition they can enjoy the health and keen delights of country living.

What are termed *Garden Cities* are sometimes built. These combine many city facilities with country surroundings, thus making desirable places in which to live. A few years ago a test was made in which it was found that lads brought up in good suburban environments surpassed all others in proper development. Why, do you think?

Garden cities.

REMEMBER: The country has many natural advantages. It has also disadvantages. If the disadvantages are recognized and handled intelligently, country homes will be so clean and beautiful that they will make those who live in them healthier and happier.

Health Problems

1. If you live in the city, make a trip to the country and describe accurately a country home in respect to cleanliness of the surroundings.

2. Write an essay comparing the city with the country where you live in regard to the healthfulness of living.

3. If you live in the country, describe improvements which could be made to secure greater cleanliness about the homes you know best.

4. Are there any rooms in the country homes you know that are rarely opened to the fresh air? If so, how should you like to live in such rooms? Why?

5. Should there be a law to prevent people from allowing the soil about their homes to become filled with pollution? Why?

6. A distinguished physician recently said he thought he should rather have children grow up in the city than in many places in the country, because he thought they would be healthier. What conditions in the country did he have in mind? Of what conditions in the city did he think?

7. Describe an actual country home you know where perfect cleanliness of all the premises can be found. Just what does the owner do to keep everything clean?

8. Many people in the city are now sleeping out of doors; do you know any people in the country who are doing so?

Review Questions

1. Why is the air more likely to be clean in the country than in the city?

2. How should a country home be situated in order to be most healthful?

3. What is one way of determining the healthfulness of a community?

4. What is the meaning of the death rate?

5. Compare the death rate in the country and in the city.

6. What diseases are particularly common in the city?

7. What diseases are more common in the country and small towns than in the city? Why?

8. How is the soil in the country likely to become polluted?

9. What will happen when there is no provision for getting rid of flowage from compost heaps, cesspools, and the like?

10. It is said that a good rain purifies the air; does it always purify the soil in the country? Why?

11. Where is the hookworm disease most common?

12. How is the hookworm disease caused?

13. How does the hookworm get into the human system?

14. How are physicians getting rid of the hookworm disease?

15. Can you say that the hookworm disease is caused by filth?

16. Does the hookworm multiply in the body? How does it multiply?

17. Do people in the country ever live in crowded quarters? Is it necessary to do so?

18. Why do people sometimes object to living in the country? What do you think of the objection?

19. What are "garden cities"?

CHAPTER IV

Making One's House Healthful

We have seen that in both city and country, there are many details to be observed for health. One of these of chief importance is the location of the house in healthful surroundings.

How one's home surroundings may affect his health.

Robert and Maher were schoolmates. At the start they were in the same class. Being very nearly the same size, and about the same age, their school fellows often called them "the twins." For several years their average in grade was nearly equal. They were always willing to do their part in the schoolroom and on the playground.

After a time, at about the age of twelve, a change came in their appearance and in their work. Robert kept up his growth in height and in strength. His ruddy cheeks showed his good health. A strong body helped him to keep a good mind, and in his studies he was still as good as the best in his class.

Maher, however, grew but slowly after the age of twelve. He looked pale then. His step lost its spring. He seemed listless often, and was sometimes dull in

his lessons. He was usually so sleepy in school that he had to be aroused to study or to recite.

His teacher wondered at his listlessness and his poor work. One afternoon she made a visit to the homes of both boys. Robert lived with his widowed mother in a tiny white and green cottage near the edge of the city. There was space about it for grass to grow, and for children to play. A wide branching maple at one side made a cool, shady spot where one could work or study out of doors in summer. At the rear, which was as clean and tidy as the front yard, was a small vegetable garden, and one for flowers. To mow the lawn and tend the gardens in summer were Robert's special tasks. To do these things required several hours' work each day before and after school. But Robert liked to be busy, and, though but fourteen years old, he took great pride in doing a good job. Besides learning to do well what he had on hand to do, Robert was cultivating health through this work in the open air. He was storing up energy for use in future years.

A visit to Maher's home revealed this fact: his family, which used to live in an open part of the town three years ago, had moved to apartments on the second floor of a tenement block. The four windows looking out upon the dusty street provided all the daylight the family could get, except a little that came in from two small windows at the rear. These rear windows overlooked a dark and dingy court filled with

filth and rubbish. Fresh air was about as scarce as light. Their only porch was the fire escape. The children had no place to play except on the sidewalk, or in the dirty street. Indoors the home had a tidy look, and appeared comfortable and cozy. But coming in from out of doors, one noticed the first thing a musty smell. The family had got so used to this they did not mind it at all, — did not notice it even. But what do you think this foul odor would mean to one who understood the matter? Maher was as fond of flowers as Robert; and while he had no garden plot, he had tried to raise some in pots. They rarely bloomed and often died. Why do you suppose the flowers did not grow in the tenement block?

After her visits to the homes of these two boys, their teacher said it was quite plain to her why Robert was the better pupil. What do you think was her reason for saying this? You can see pictures of these two boys on page 26.

Where one lives and also how one lives make a vast difference in what he can do and how he can do it. A pupil must always be at his best in order to do his best surely; and to be at one's best means to be in health, does it not? You must see that a healthful home is a great aid to health. The house itself as well as the things in it, and that which surrounds it, have all to do with its healthfulness.

No one knows just what the earliest houses were like. Probably man's first home was simply a shady

nook, a bower, or a mere shelter beneath the thick-spreading branches of a tree. Would such an open-air abode be healthful? Why? In a warm climate and in the absence of wild beasts and other foes, it would be enough for protection, would it not?

When protection from cold and storms, as well as shelter, was needed, it is probable that a structure something like the one in the picture was made. Two small trees standing near together with their tops bent so as to meet were fastened with a rope of bark. These formed the beginning of the framework. To complete this, a circle was made of small trees uprooted for the purpose, and dead branches which the wind had cast upon the ground. Twigs and stems woven into this rude frame would make quite a good protection from wind and storm and roaming beasts.

How man built his early home.

ONE OF THE EARLIEST HOUSES.

But trees were not always at hand, nor could they be moved from place to place. With the roots and branches broken off, small trees formed very good poles. The poles, stuck in the ground to keep them

firmly in place and overspread with a covering made from the skins of animals, made a good tent.

Such a tent or hut could be carried easily from one place to another. If a permanent home was desired, a similar framework interwoven with rushes or long grass made a strong hut.

A New Zealander's house.

The earliest men had but few and simple wants. They had no need of much furniture and a great house. Most of their life was spent in the open air and sunshine. Nature was their teacher, and the fields and forest their schoolroom. They learned many lessons not found in books. They earned their food by the sweat of their brow. To keep their surround-

ings good, they made frequent charge to new places where all about them was fresh and clean. While they did not have so many wonderful and useful inventions as the people of this age, they possibly did have what everybody in these days wants, — good health. Do you think, considering the way they lived, that they would have better health than the people to-day? Give your reasons.

As the number of people increased, and as they scattered over the face of the whole earth, they devised for themselves all manner of dwellings. These have been and are still made of many different materials and of varying shapes and sizes. How many different sorts of houses have you seen or read about?

Whether the house be a tent or a tenement, a cabin, cottage, or mansion, the same health laws apply to each. Abundant sunlight, air, and thorough cleanliness are first among the needs. Do you think the poor and the rich alike can possess these if they wish them? Is it easier to get them in the country than in the city? Why?

Why we need sunlight in our houses.

Neither animal nor vegetable life can flourish in the dark. Watch the greenhouse keeper, and you will notice he takes care to turn his plants day by day so that all sides will be equally exposed to the light. When this is neglected the plant growth is deformed. The portions that receive the most light grow luxuriantly. Portions left in the shade are likely to be dwarfed. Some primitive people

dwelt in caves. Probably they did this from necessity because of many foes. But the cave dweller probably spent the greater part of his waking hours in the sunlight, occupying his cave at night or in time of special danger only.

WHY DOES THE GARDENER TURN HIS PLANTS AROUND FROM DAY TO DAY?

Some modern people build for themselves dwellings which shut out the sun and oftentimes the fresh air just like caves. This they do, not from necessity but from carelessness or from choice. Why, do you think? Did nature ever intend that we should spend any time except night in darkness? Give reasons for your answer.

Most animals become inactive if they stay in the dark. Watch a little starfish lying in the water. When the sun shines, it puts its arms slowly forth, then draws them back again. Now let a cloud pass over the sun; the little creature at once folds its arms and

becomes quiet. As soon as the cloud passes off, it becomes active again. When the sunlight disappears, some plants fold their leaves, and droop their branches. Often flowers close up when darkness falls.

Our bodies are just as sensitive to light as are plants or starfish. Human beings, like plants, are likely to droop in the shade. So you can see why sunshine, as well as fresh air, is necessary for health.

Should a house, whether home, schoolhouse, factory, or shop, provide for abundant sunlight in every room? Show why, if you think so. Do working people need sunlight in their workrooms? Why?

IF ANIMALS LIKE THESE ARE SHUT UP IN DARK PLACES THEY QUICKLY DIE. WHY?

Perhaps some day we shall have houses with walls of thick glass through which light can shine, instead of walls of brick and wood which keep out light. Until then we shall have to depend upon windows; and to capture enough sunshine there must be plenty of them. We can draw a shade and shut out the light, if because of too many windows the sun shines too brightly at any time; but we cannot add more sunlight when there

are not enough windows. A house all in one room with windows on all sides could be well supplied with sunshine if built on open ground.

A house divided by walls into many rooms may get the sunshine from but one side at a time. In winter the people in our country live mostly indoors. It is necessary then to have as much sunshine as possible within the house. In winter time, the sun rises south of east and goes down south of west. A house that faces the southwest or southeast will then get the most sunshine during the short winter days.

Do you think all rooms in which people, awake or asleep, live should have a bath of sunshine at some hour every day? Give your reasons.

It is well known that, with other things equal, the children on the sunny side of a hospital ward are more likely to get well than those on the shady side. Why should this be so? Which side of the house do you prefer in winter?

In cities, the shadow of near-by tall buildings often cuts off the sunlight from one's house. On thickly built streets the first floors of houses often lack sunshine for almost the entire day. What can you think of that would keep sunlight out of country houses?

Dark rooms soon get musty and moldy. A musty odor is a signal to the nose that fresh air and sunshine are needed. What do fresh air and sunshine do to the germs that make the musty odor?

To insure a supply of light and sunshine, a good plan

is to allow window space enough to equal at least one third of the floor space. How many windows 5×3 feet would then be needed for a room 10×12 feet ?

Does your schoolroom have windows enough to let in sufficient sunlight ? How is it with your sleeping room ?

If one can choose the place where his house shall be built, as the birds choose the places for their nests, he ought to choose some open spot where the land has a gentle slope or the sunny side of a low hill.

When the snow melts or the rain falls, sloping land drains dry more quickly than level land. Why ? Should you wish to have a sluggish stream, a pond of stagnant water, a swamp, or anything of the sort near your house ? Why ? Should you wish to be where smoke and dust from factories and shops would send you bad air to breathe ? For the city dweller, the best choice for a home would be in some high part of the town beyond the dust and din of the busy streets. A corner of two streets is likely to afford more sun and better air than can be got elsewhere. A most delightful place for a city home I once saw was a square of dwellings around a large court of green grass made garden-like with shrubs and flowers. At the front, each house stood well back from the street, and had its own plot of grass.

When we have found a sunny, airy place for a house, we need next to make sure that the ground is

not the kind that holds water. You know a great deal of water falls upon the earth in rain. Some soils readily allow this rain to drain through.

A damp spot, a bad place to build a house.

Try this experiment: Fill four tumblers each half full, one with gravelly soil, one with sand, one with garden dirt, and one with clay. Pour one-fourth of a cupful of water slowly over each, and note which the water sinks into most rapidly. You will see that the water will pass quickly through the gravel. But unless there be cracks to let it through, the water will remain standing on the clay. Which of these soils do you think would be best for building one's home on? Why?

If one cannot have a good *porous* soil upon which to build his house, then moist ground may be made dry by lines of tile drain pipes laid beneath the foundation of the house. To have a drain around the outside of the foundation walls of the house to carry off the moisture is always a good plan.

Do you know that there is air as well as water in the ground? Suppose you try this experiment: Take an Argand lamp chimney. Fit each end with a good cork. Make a hole in the center of each cork, and insert a small glass tube. Put a layer of cotton next to the cork. Remove one cork and fill the chimney with earth and replace the cork. Place the end of one of the tubes near a candle flame. By blowing into the other end, the flame will be made to flicker, showing that the earth is *porous*.

The air in the soil is not so pure as that above the ground. Dead matter of various sorts is buried in the ground, in many places. This matter gives off foul gases. Then there are often leaky gas and sewer pipes underground. So in a good many ways the air beneath the surface becomes impure, and we ought to prevent this ground air from getting into our houses. You see, then, that the foundation walls of some houses which are laid on or beneath the surface need to be moisture proof and air proof.

If ground air or damp air gets into the basement of the house, the parts above will act much like a chimney. The air in the living rooms, warmed by the sunlight or the heater, will constantly be rising, and the cooler ground air will be drawn up to take its place. Thus there will be a constant upward current of the foul damp air from the ground.

You can try this experiment yourself easily. Shut all the doors and windows in the cellar. Place there an open bottle of some strong smelling stuff, like ether. Then go to the room above. After a little time, you may notice the odor of ether. In this way, you will discover that some of the air below has made its way into the upper rooms.

In Germany recently, some experiments were tried which proved that half the air from a cellar ascended to the rooms of the first floor, one third to those of the second floor, and one fifth to those of the third floor of a house. You see, then, that what is beneath a

house counts for a great deal in making it healthful or otherwise. In warm countries, houses are often set on piles. This plan is a very good one, if the piles are high enough to allow the air to circulate freely underneath the house.

The cellar, the part of the house most to be considered.

If one can get a basement with damp-proof walls and floor, it should extend under the entire house. It will make the rooms above drier and will keep the floors warmer in winter. The other day I inspected the cellars of several houses. One of these was just a hole dug in the earth and walled about with stones. When there are heavy rains, and thawing in the spring the water trickles in between the stones. Sometimes it fills the cellar a foot in depth. There are but two windows, and these are on one side. If the cobwebs were not so thick, one could see that each window has three small panes of glass. The windows are fastened down with nails. The place is dark and damp and dirty. Have you ever seen such a cellar as this?

Near by was another cellar. When it was built, pipes were laid to drain the ground. The base of its walls is made of concrete, as is also its floor. The wall is built in two tiers. A space between these filled with asphalt makes the wall damp-proof. Inside, the walls and ceiling are plastered and painted white. All pipes are likewise painted white, and this makes the dirt plain to be seen. Then, too, there are plenty of windows that open with ease to let in light and air. The

place is dry, light, and easy to keep clean. Have you ever seen a cellar like this? Above which of these cellars would you rather live? Why?

Should you think the plan of storing rubbish and things that decay or mold in a cellar a safe one? Do you think care and attention in regard to cleanliness and fresh air are as necessary for the basement and cellar as for other parts of the home?

Much can be done to keep the cellar clean by bringing into it no unnecessary dirt. When vegetables are to be stored in the cellar, it is well either to brush or wash them first. It is best that everything be so placed and arranged that frequent cleaning will be easy. No decaying stuffs like potatoes, apples, or the like, should be permitted to remain in a cellar for even a day.

A healthful house has no clutter places nor dark closets. Why? Even the tiniest clothes room has some way for light and air to enter. Darkness favors dirt, and develops germs. Wherever darkness is, wherever things are out of sight, there is the place to be watched and kept clean and airy.

REMEMBER: A healthful house must have an abundance of sunshine and fresh air, and must be clean from cellar to garret.

HEALTH PROBLEMS

1. Pick out some one you know well who is very healthy, and who does not have to be out of school much for sickness. Tell the class in what sort of a home he lives, — whether in a

crowded street in the city, or in open spaces in the suburbs; whether there are many windows in his house, or only a few; whether he is out of doors much of the time, or whether he is in the house when he is not in school. Try to give these facts accurately.

2. If you can possibly do so, find out whether children who live in the country are usually stronger and healthier than those who live in the city.

3. If you have a small pot of flowers growing in your house, see if your parents will permit you to put the flowers in a dark place, say in a dark corner of the cellar. Leave the flowers there for a few days, and then tell what has happened to them.

4. Measure the window space in your living room, and also the floor space, and then see what their relation is. What relation should there be between the floor space and the window space of a room?

5. Does the sun shine most of the days in the region where you live? How many cloudy days do you think there are during the year?

6. Do you know any people who do not get out in the sunshine or fresh air for several days at a time? Are they healthy people?

7. Should there be a law in every town and city which would prevent people from building their houses without leaving open spaces between them? Why?

8. What should you do with a house which was filled with musty odors?

9. What may one do who lives in a large city in order to get fresh air and sunshine?

10. Usually one feels much better when he spends the day in his living room rather than in his cellar. Why is this so?

11. Give the class an account of "The Black Hole of Calcutta." If you do not know about it now, look it up, or have some one tell you about it.

Review Questions

1. Tell the story of the two boys who were the same age, and who were about the same size up to the age of twelve, but who did not grow at the same rate afterward.

2. Why did Robert keep up his rate of growth, while Maher did not grow so fast? Why did Maher take so little interest in his studies after twelve?

3. What sort of smell is found in rooms that have little light and air? Why?

4. Can one get so used to musty odors that he will not notice them? If so, does this mean that they are of no harm to him?

5. Can one do as good work when he lives in a dark, ill-ventilated house, as when he lives in a bright one where he has plenty of light and air?

6. Did the men of long ago live in houses such as we have to-day? How did they protect themselves from the winds and storms? Is it healthful to live in a tent if the weather is not too severe?

7. What must one have in a house in order to keep in good health?

8. Is animal life active in the dark? Tell about the star-fish in the light and in the dark.

9. Are our bodies as sensitive to light as are plants and star-fish?

10. What must we depend on in our houses in order to get enough sunshine?

11. How should your house face in order to get the most sunshine in winter?

12. Should all rooms in one's house have a bath of sunshine every day?

13. Which rooms in a hospital are best for people, — those on the shady side of the house or those on the sunny side?

14. How much window space should one have in a room in order to get light enough in it?

15. What kind of spot should be selected for a house, if one can have a choice?

16. What sort of ground should one avoid in building a house?

17. If the cellar is damp and musty, will the bad air be likely to get into the living rooms? Why?

18. How can you detect whether bad air is coming from your cellar into your sitting room?

19. How do people sometimes build their houses in warm countries?

20. Do people build cellars ordinarily so that enough light and air can get into them?

21. Should one have closets for storing rubbish in one's house?

22. If you were to buy or rent a house, what points would you look for in order that you might have a healthful house?

CHAPTER V

Ventilating the House

Some years ago the United States government made a special effort to teach the Indians to till their land, which they had let lie entirely idle. It was divided for them into farms. Shortly after the houses were finished, and the Indians were moved into them, the agent was called to another place for a time. When he returned two years later, you may imagine how great was his surprise to find the Indians had all returned to their wigwams, and the houses he had taken so much pains to provide for them they were using to store their farming implements.

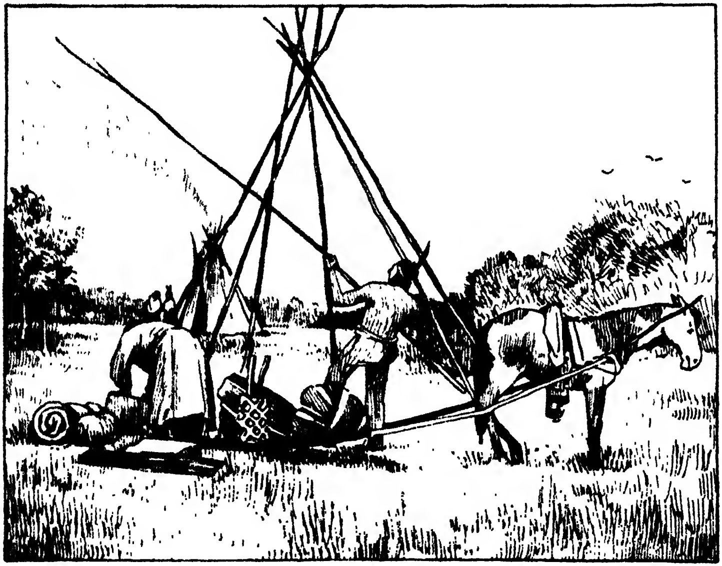
Impure air causes sickness.

Asked why such a change had been made, the chief answered, "Too much house." The agent was told that when they lived in the houses they all got sick and some of them "spit blood." When they went back to their wigwams, they got well. Very naturally they preferred health to houses. Why do you think the Indians became ill when they lived in the houses?

Nature intended man to breathe fresh, outdoor air, and provided for his needs an ocean of it ninety miles deep all around the earth. But when he chooses

to spend his days almost wholly in houses, he does not observe Nature's plan for his welfare, and thereby he usually becomes a loser.

You have learned by this time that Nature's laws are fixed and changeless. Obey them, and you will be



THE INDIANS LEFT THEIR HOUSES, AND WENT BACK TO THEIR WIGWAMS.

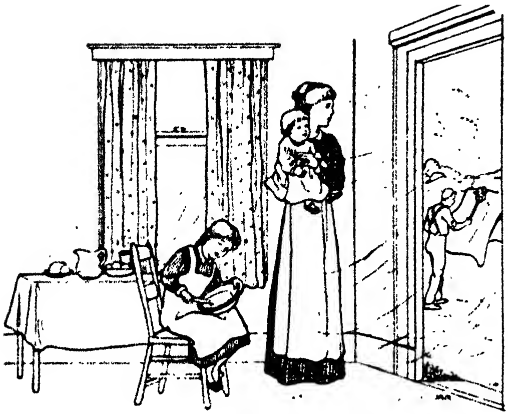
rewarded with good health; break them, and you will pay the penalty in sickness. Nature's penalty for shutting oneself away from outdoor air is often disease of those organs which take air into the body. The monkeys in the New York Bronx Zoo used to be kept in quarters that were dark, dirty, and devoid of

fresh air. Many of them got sick, and died of tuberculosis; for animals as well as men have this disease. Their keepers brought some expert physicians to see the monkeys. The doctors told the keepers that it was living without fresh air and sunlight that made the monkeys sick. Then they were removed to a sunny, airy, clean place. Those that were very ill were placed in separate quarters; because, as you know, the germs which cause tuberculosis may be conveyed from one to another, and from the sick to the well. When the monkeys changed their quarters, they began to get fat. Even those that were ill got better, and some of them got well. If their keepers had at first placed them in clean cages where there was plenty of outdoor air and sunshine, it is probable that none of them would have become sick, at least not with tuberculosis.

This disease kills more people than any other. Every year something like two hundred thousand men, women, and children die of this dreadful plague, and seven hundred thousand other people are sick with it. Outdoor air and sunshine, and good food, with proper cleanliness, would save most of those lives.

Indoor air is not as pure as outdoor air.

You may wonder why indoor air is not just as good as that out-of-doors. In the first place, it is never wholly clean nor fresh. Almost all air has more or less dust in it. But the air in the open country is freer from dust usually than it is in towns and cities. Only on the tops of



SOMETIMES THE AIR THAT COMES INTO THE HOUSE FROM OUT-OF-DOORS IS SPOILED AS YOU SEE IN THIS PICTURE. HOW CAN THIS BE REMEDIED?

high mountains and over large bodies of water some distance from shore is the air entirely pure. But the dust atoms in indoor air exceed many times the number found in air out-of-doors. Then, too, in the house there may be leaky gas pipes, odors from cooking, coal gas from ranges or furnaces, and mold and germs from various sources.

Outdoor air the best.

The bodies of those who live in houses are constantly throwing off impurities from the skin and lungs. While these impurities may not accumulate in the air to a deadly extent, except when a large number of persons are kept for some time in a very small space, as has sometimes happened in prisons and in storms at sea, still if there is only a small amount of air in the house, and there are several persons breathing it, it soon becomes full of impurities, and it is then not fit to take into the lungs.

Suppose you put a number of goldfish in a small

glass globe filled with water. A fish, you know, gets air from the water in which it swims. As it breathes, each fish takes a small quantity of water into the mouth, and then expels it through its gills. After a time, all the water in the globe will have been in some fish's mouth. If the water is not changed or purified, then the fish will die. Just so it is with people in a schoolroom, a lecture room, a church, a living room, or a bedroom into which no fresh air is entering. It does not take long for all the air to pass in and out of some one's lungs, in a room in which there are several persons. Then the process is gone over again, and there is no telling after a while in how many lungs the air has been. Would any person willingly put into his mouth articles of food that had been in another person's mouth? Do you not think that just as much care should be taken not to breathe second-hand air?

You have, of course, learned of the change that takes place in the air when it is breathed into the lungs. The most important change that occurs is that, when it comes out from the lungs, it contains *carbon dioxide*, which is formed in the body, and is a waste of no use whatever to the body and really harmful to it. What is the plan of nature in making this carbon dioxide in the body and throwing it out with the air as it leaves the lungs? Do you not think that the carbon dioxide and the other impurities in air that has been breathed in some one's lungs should be got out of the body just as other waste is? Nature can use

carbon dioxide for her green plants and vegetation. How does she do this? She will give us a free exchange of good air for bad air, if we will allow her to do so. But the foul air of itself cannot get out of a boxlike house that incloses it; neither can the fresh air of itself get in. Some way is needed to draw the

OUT-OF-DOORS IS THE BEST PLACE FOR CLEAN, COOL, NOT TOO DRY AIR.

fresh air in, and to drive out that which has been already breathed.

Out-of-doors the winds change the air. Bees in hives use their wings to create an artificial wind or current so that the air will be kept in circulation. We cannot, of course, empty air from a room like water from a bottle, and fill the room anew with fresh air.

Air of some kind must remain constantly in the room or in any vacant space. Why, do you think?

If a bottle had an opening at both ends, we could pour in water at one opening, while the water already in the bottle was being let out at the other end. Thus we could keep the bottle filled, but always with fresh water. By a similar method the air in the house may be changed. Two openings are always needed, with a constant flowing of fresh air into one, and of used air out of the other, just as water flows along in a creek or river. The size of the opening for fresh air depends on the number of people for whom the air is to be supplied. For each individual, an opening of 2 × 12 inches is none too large. If the opening is covered with a grating, as is usual, it should be at least one-half larger. What space would be required for five persons?

How to keep in door air fresh.

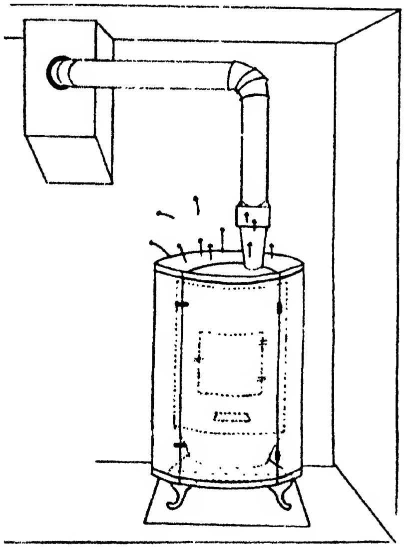
In the days when our forefathers warmed their dwellings with big open fireplaces, every home had a ventilator. With a fire burning, a heated current passed up the chimney, and constantly drew off the air from the room. Just as constantly fresh air from the outside rushed in through every crack and crevice, between the window sash, under the doors, and in whatever way entrance could be found.

When there is not a fireplace, some arrangement on the same plan may serve very well. For instance, an opening near the floor leading into a heated flue, or an upright shaft built purposely for ventilating and

placed next to the chimney which is always warm, will keep the air changing constantly in a room. The chimney keeps the shaft heated, and thus makes a draft to draw off the impure air. An entrance for fresh air may be provided on the opposite side of the room.

It is a mistake to suppose that *fresh* air must be *cold* air. Very cold air may be bad; and warm air may be as clean as any. Have you noticed that cold air out-of-doors is always invigorating? Why should this be so? All we can get of it will benefit us if we ourselves keep warm. It is the still, cold air indoors that chills one. But it is in every way better that in cold weather the fresh air be warmed before it enters the room.

Heating the air.



A STOVE WITH A JACKET. A "COLD AIR PIPE" RUNNING UNDER THE FLOOR TO THE OUTSIDE AIR BRINGS IN A SUPPLY OF FRESH AIR TO THE BOTTOM OF THE STOVE, AND THIS IS WARMED AND SENT INTO THE ROOM.

Of all the means for heating houses,

stoves are most used. But without some special way of ventilating, they are the most unhealthful. A stove is likely to heat the same air over and over again. If the fuel be coal, oil, or gas there is more or less constant danger, too, from the escape of poisonous gases into the air of the room.

How to use the stove properly.

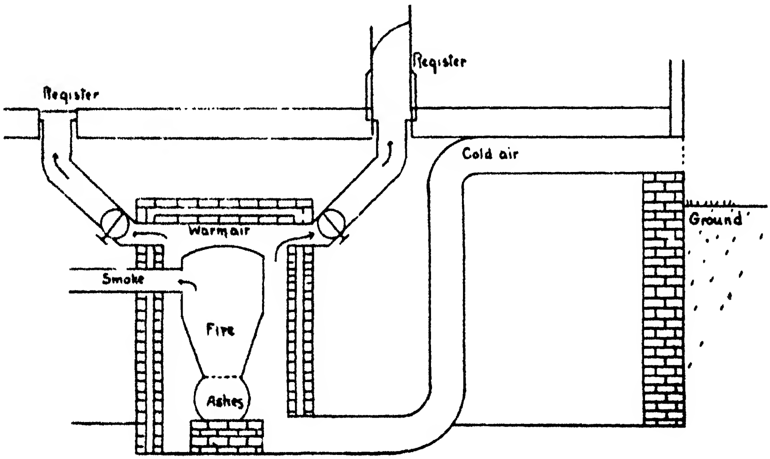
A good plan to follow when a stove is used is to place a sheet-iron jacket around it, and thus make an air space into which fresh air can be brought. A grating over the top like a register will admit the warm air into the room.

One way of warming the air before it enters the room is to warm the house with a heater standing in an inclosed air chamber. Steam or hot-water coils for heating this chamber are better than a furnace. Why should this be so?

To this air chamber, fresh air may be brought direct from out-of-doors through a *duct* or "cold air pipe." After being heated, the air is distributed through pipes to the rooms above. Thorough screening of the outdoor end of the duct is needed in order to prevent the dust from coming in with the fresh air supply. The air chamber must also be clean and so arranged that no dirt and no foul gas from the heater can escape into it. Some people think it is just as well to take the air from the cellar or basement where the heater is located as to take it from outdoors. Do you know of any reason why this will not do?

Heating the air properly.

A fresh-air heater needs to be large enough in order to supply rooms with plenty of warm air. When there is a large supply of air, it will not be necessary to make it very hot in order to keep the house warm enough. But if the furnace is so small that it is capable of heating only a small amount of air, in order to



A DIAGRAM TO SHOW HOW FRESH, PURE, WARM AIR MAY BE OBTAINED IN A HOUSE HEATED BY A FURNACE.

supply proper warmth, it will need to be so hot that it may become what is termed "burnt air," which is not good for breathing.

When fresh air is heated before being admitted to a room, the opening for the outlet of foul air should be placed near the floor. Why? But if the fresh supply comes into the room cold, then the best point for tak-

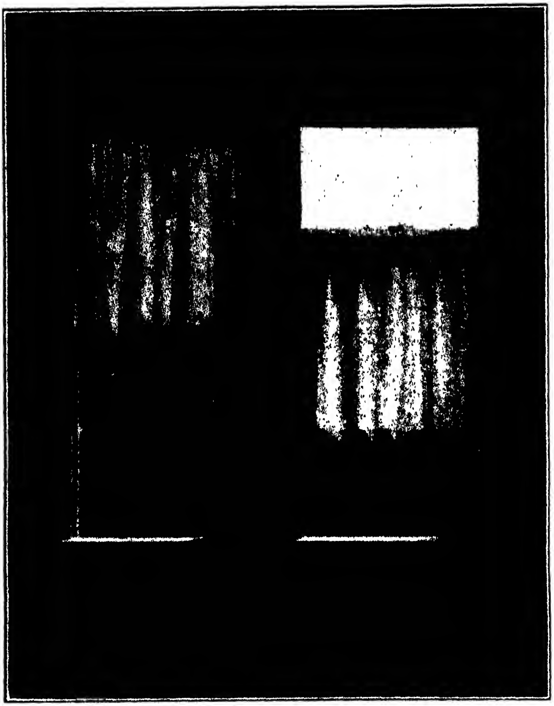
ing out the impure air is about four feet from the floor. In this way we can secure a thorough mingling of the cold air with the warm air. What will happen if the outlet is near the floor, when the fresh air coming into the room is cold ?

You know, of course, that warm air rises because it is lighter than the cold air around it, just as a cork will rise to the top of water in which it is placed. Breathed air is always likely to be warmer than fresh air, and when there is no way for it to get out, it may accumulate in the upper part of the room. There it remains like an invisible cloud until it cools, when it sinks and becomes again mixed with the air below.

At the time a house is built, provision needs to be made for its ventilation just the same as for its lighting and heating. A great many houses are built with no provision for a constant change of air. If you live in such a house, you may ventilate it after a fashion by the aid of windows, because the poorest air is near the top of the room. A good way to do is to lower the upper sash six inches. This provides for an outlet for foul air. When an outgoing current is made, fresh air will come in from doors, windows, and every opening. The space between the two sashes when they overlap makes an inlet through which cold fresh air will enter.

People sometimes throw up the lower sash as high as they can, expecting to ventilate in this way perfectly. This does not serve the purpose very well, because the

warmer, foul air tends to rise to the ceiling and remain there. To try to drive it out by letting in fresh air

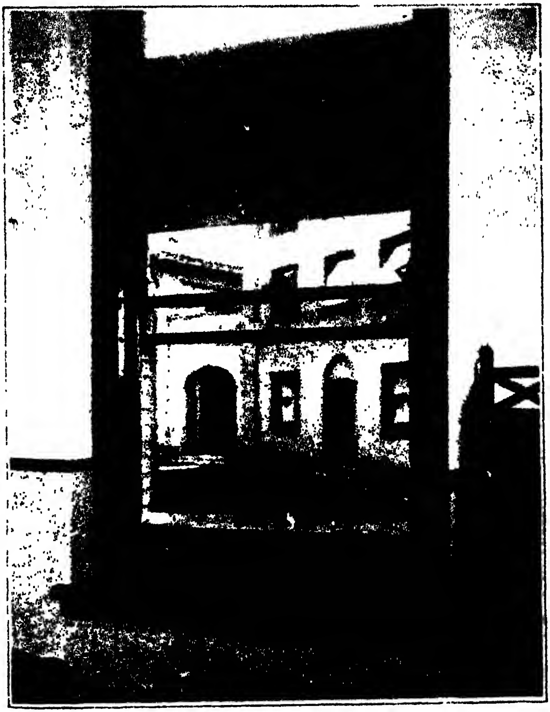


VENTILATION THROUGH WINDOWS IS NOT PERFECT, BUT IS BETTER THAN NO VENTILATION.

below it is very much like trying to pour water into a bottle already full.

If there be two windows on opposite sides of the room, try raising the lower sash of one and lowering

the upper sash of the other. What do you think will happen to the air in the room when you do this? The



A DEVICE FOR THROWING INCOMING FRESH AIR UP INTO THE ROOM. SHOW HOW IT WORKS.

size of the opening needed will depend on the difference in temperature between the indoor and the outdoor air; and also on the force of the wind, and the number of persons in the room needing fresh air. A

very small opening in cold weather will let in a good supply of air. Why? When there is no way to ventilate except by windows, they need to run very near up to the ceiling. Why do you think this is necessary? Do you think it will make any difference in the ventilation of the house if the window has shades or curtains?

If you will raise the sash of a screened window, you will feel the air as it enters much less strongly than if the window has nothing before it. The meshes of the screen so break up the current of air that it appears as if it were sifted into the room. When air thus comes in, even if it be cold air, it is much less likely to chill one. A small frame covered with cheesecloth, or a board full of small holes fitted in the window opening, is a good thing to prevent a strong draft when windows furnish the only ventilation.

Some device that will direct the entering air upward, as shown in the picture, so that it will first mingle with the warm air of the room is desirable; otherwise the floor will always be cold. Is the air on the floor of your schoolroom colder than the air at about the height of your head? If there is any difference, explain it.

In cold weather, indoor air quite often becomes too dry for comfort. Out-of-doors there is always a certain proportion of moisture in the air. This is needed for health. Such a great amount of heat is often used for warming house air that the moisture is quite

dried out of it. The air then seeks to secure moisture from the furniture, the walls, and everything in the room, and particularly from the bodies of the people in it. Then one's lips and nose and throat get dry, and his skin feels parched. This is most uncomfortable. It is also harmful. The drying of the mucous membrane which lines the nose and throat makes it easy for certain kinds of microbes to grow, and these cause colds, catarrh, grippe, pneumonia, and tuberculosis. Can you tell whether the air in your schoolroom and house is too dry? See if you can find out. Of course, too much moisture in indoor air, as shown when vapor covers the windows, is harmful, just as too dry air is.

Air may become too dry.

Avoid having the air too dry or too moist.

Sixty-eight degrees is a good temperature for us to accustom ourselves to indoors. Air at this temperature is not likely to get so dry as to be harmful. It is better to wear more clothing if need be than to heat houses to 80 degrees or 90 degrees in order to be warm. Most furnaces are supplied with water pans, which, if always kept filled, will supply some moisture to the air, though usually it is wise to have some arrangement in every room by which the air can secure moisture. A dish of water on the steam coils or stove is often useful.

The right temperature for air.

In one house where no way had been provided to add moisture to the furnace-heated air, a boy suspended a quart pail filled with water in a floor register.

In this he put a broad strip of old linen long enough to reach to the bottom, and hang over the outside of the pail several inches below it. This made a siphon to carry the water by drops into the pipe. As each drop fell on the hot furnace pipe, it was made into steam vapor.

REMEMBER: If one desires to be strong and healthy, he must breathe good, fresh air, and he must be on the lookout all the time to see that in his home or his schoolroom the air does not become "dead" and unhealthful. Good health and good spirits require constantly changing air, which we can usually get without any effort out-of-doors, but for which we must specially plan indoors.

Health Problems

1. Do any Indians live in your community? If so, do they shut themselves in houses in the winter, or do they live out-of-doors a good deal?

2. It is frequently said that the Indians die rapidly when they come to live in one of our cities. Should you expect this to be so? Why?

3. Think out some way to show that indoor air usually has a good deal of dust in it? Where does the dust come from?

4. Find out a way to tell whether the air in the schoolroom is being constantly changed. Is it being changed constantly in your own home? Describe the tests you have made to show what is happening to the air.

5. Find out a way to show that air when it comes from the lungs is not the same as it was when it was breathed into the lungs.

6. Make a drawing showing how the fresh air comes into the schoolroom, and how the breathed air leaves it. Do the same for the living room in your house.

7. When do "coughs" and "colds" seem to be most frequent in the school, — when the doors and windows are left open most of the time, or when they are kept closed? Explain.

8. During what season of the year are we likely to get the least amount of fresh air? What special pains should we take at this season to secure enough fresh air?

9. Make a drawing showing an air chamber for heating fresh air from out-of-doors. Show how the fresh air comes in, and how the heated air rises to the rooms above.

10. Can you tell "burnt air" when you come into a room where it can be found? What does it seem like?

11. Find out a way to test whether the air one breathes out in the schoolroom rises or falls. How is it with the fresh air coming in?

12. Open from the top the windows in a room in which people are living. Then test whether fresh air pushes in between the sashes, through the keyholes in the doors, and in other ways. Explain.

13. Suppose it is warmer outdoors than indoors, and you raise or lower your windows. Will you get a supply of fresh air? Explain.

14. What is the usual temperature of your schoolroom? Of your home? Do you ever go into rooms that are too hot? How do you feel when you are in there?

15. Do you know any family in which the home is kept at about 80 degrees most of the time in winter? Are the people who live in such a home strong and healthy? or are they sickly, having "coughs" and "colds" most of the time? Explain.

16. Most people seem to feel in better health on days when there is a breeze blowing than when it is quite calm. Why should this be so?

Review Questions

1. Tell about the Indians who had comfortable houses built for them, but who preferred to live in their wigwams. Why did they dislike to live in houses?

2. What sort of air did Nature intend we should breathe?

3. What does Nature do to one who breaks her laws in regard to pure air?

4. What dreadful disease kills about 200,000 people every year in this country? What would save most of the lives of these people?

5. Why is indoor air not just as good as outdoor air?

6. What is often found in indoor air which makes it unhealthful?

7. Why does air in a room in which people are living become impure unless it be changed frequently?

8. What change takes place in air when it is breathed into the lungs?

9. How does Nature use the carbon dioxide which is breathed out of the lungs?

10. Can foul air get out of a house without special provisions being made for it? Can the fresh air get in of itself?

11. How do bees change the air in their hives when it becomes impure?

12. Will Nature supply fresh air in a house if we keep the windows open?

13. If we cannot keep the windows and doors open, what is necessary in order to have a supply of fresh air constantly?

14. What should be the size of an opening for letting in fresh air for each person in a room?

15. Is an open fireplace good for ventilation? Why?

16. If there is no fireplace in a room, how may one make something which will act in the same way for ventilation?

17. Is cold air always good air?

18. Is it better to warm cold air before it comes into the room, or after it enters ?

19. What is the best way to make air warm before it enters the room ?

20. What care should be taken to keep the air that comes into a room clean ?

21. Is it well to take air from the cellar or basement where the heater is located ?

22. If one ventilates by means of windows, how should they be opened ?

23. What part of the room does the breathed air usually occupy ?

24. What precautions should be taken to prevent the floor from becoming too cold because of the cold air coming in ?

25. Why is it not the best way to ventilate a room by simply throwing up the lower sash as high as one can ?

26. Why is it well to have a window screened when cold air is being admitted through it ?

27. What is a good way to avoid a draft from a window which is letting in cold air for ventilation ?

28. Is the air in houses in winter likely to be too dry ? Why ?

29. How can one prevent heated air from becoming too dry ?

30. Is very dry air unhealthful ? Why ?

CHAPTER VI

Lighting the House

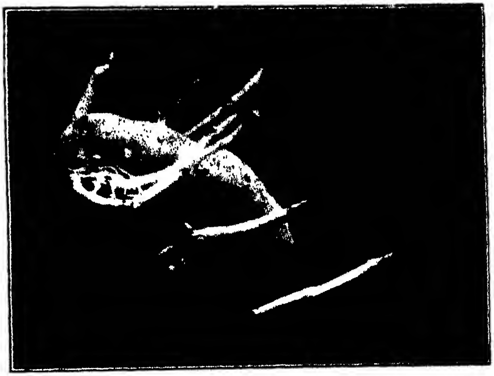
Light necessary for health.

I once saw some fish brought from a stream that flows through a large underground cave. They looked much like the fish which one can find in lakes and streams about his own home, except that they had no eyes. Why do you think these cave fish did not have eyes?

All creatures with eyes were intended by Nature to live where there is light. Most animals and vegetables grow best in places where there is light, at least during the daytime. This is as true of human beings as it is of animals and vegetables. You have already learned that people who live in dark places, as dark basements, cellars, and the like, are usually unhealthful. Do you know that miners who work underground during the daytime are pale, unhealthy, and likely to be short-lived? Have you heard also that people who live in the shadows in the deep valleys of the Alps Mountains are sickly because of the lack of light? Do you think people could live long in the heart of a forest into which very little sunlight could enter?

Recently some men who have been exploring in the

Arctic regions have told us that the six months of night up there did more harm to their health than the severe cold of the winter. They say they can endure cold weather in itself, if they can only have some sunlight with it. But when it is both cold and dark, they find it very hard to keep well. Have you noticed that you feel better on a very cold day if the sun shines than if it is cloudy? When it is zero weather, would you rather be out during the daytime when the sun shines than during a dark night?



NOTICE HOW PALE THE SPROUTS THAT GROW IN DARKNESS ARE, AND HOW THEY BEND TOWARD THE LIGHT.

Probably every one has been in a cellar where vegetables are kept, and has observed potatoes sprouting and trying to grow even in the darkness. Have you noticed how pale the young shoots are, and how they struggle to get to the light? Have you observed that any vegetable starting to grow in a cellar will bend in the direction of a window or a door through which some light enters? Why do they do this?

If you will notice people who are accustomed to live

or work in basements or in other places into which but little light enters, you will probably find that they are pale and weak, as compared with persons who live and

Would you guess that these two boys spent much time in the open air and sunlight?

work in rooms in which there is a good deal of light. Have you observed whether children who grow up in narrow streets or alleys with tall buildings so that the

sun cannot enter them are likely to be puny and sick, often with stunted bodies and not very lively minds? In many cities people are now seeking to do away with all dark streets and alleys. In places where they cannot do this, they are trying to have large, airy, and light playgrounds, which may be used by all the children of the city. In some of the large cities they are now beginning to have playgrounds on the roofs of the tall buildings. If these roofs are properly protected, do you think they will make good playgrounds? Why? Is there likely to be as much dust and soot on the top of a twenty-five story building as on the street?

When people lived in houses made of twigs or in tents and wigwams, they could easily get light enough. But it is not so easy to get sufficient light in a modern house, especially in a city where houses are very close together. As you know, of course, the light from the sun in the sky is brought into our houses through the windows. A neighbor of mine always leaves the upper part of her windows without shades or curtains, because she has noticed that the light comes mainly from the top of the windows. Have you noticed this fact? Why should it be so?

How to obtain plenty of light.

You would think everybody would know that clean windows let in more light than soiled ones, yet there are many people who appear not to have observed this, for they do not keep their windows clean. Not long ago a test was made of the windows in a number of

schoolhouses. The test was made by means of a *photometer*, which is an instrument that can measure light, just as a thermometer can measure heat. This photometer was used in these schoolhouses to show how much light was coming through the windows. In some of the rooms the windows were quite clean, and in others they were very dirty. The light entering through the windows was measured at three different times: first, just before they were cleaned; second, just after washing one side of the windows; third, after washing both sides of the windows, so that they were perfectly clean.

You may not be surprised to learn that even with the cleanest windows there was a considerable gain in the amount of light which came through them, after they were washed. In the case of the dirty windows, there was about one-third more light that came through them after they were cleaned. What does this suggest regarding the necessity of giving attention to the windows in a house?

The value of light. You can see now why it is important that every building used for work or a home should have a good supply of windows which should be kept clean. These windows should be placed so that every room, whether used for living or for sleeping, should have a bath of sunlight for part of every day. In some countries visited by tourists, like Italy, for instance, the people having rooms for rent always charge more for those that face the sun than for those

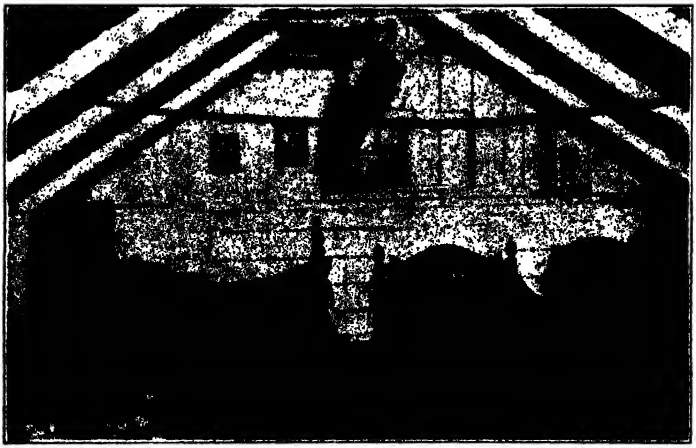
that do not receive much light. Often one may read advertisements in which the landlord says that all of his rooms have sunlight every day. Do you think a person might very well pay more for the rent of a sunny room than of a dark one?

It is generally true that when rooms are dark, you can find dirt hiding away in the corners. If for no other reason, then, rooms ought to be well lighted so that any dirt in them can be detected easily. You have already learned why dirt should be got out of the house, and nothing more need be said about it at this time, only that you should not forget that cleanliness is the first condition for good health.

In very warm countries the houses often have so few windows that they are very dismal inside. But many of the people in those countries have learned the value of light; and they strive to live in it and work in it, so that often they spend most of their time on the street or in the yards attached to the houses. In some of these countries, you can observe that the people practically live out-of-doors. They cook and eat out in the open. In some of the cities in these warm countries, the cafés and lunch rooms are out on the street instead of in dark places in houses. Even in a city like Paris, which is not very warm, the restaurants are, for the most part, out-of-doors on the boulevards or in the parks. Would it be a good plan if we in this country could live out in the open more than we do, cooking and eating our food out-of-doors? Do you like

to go on picnics where you eat your luncheon on the grass?

Artificial light, however it is made, is quite different from natural sunlight. Men have tried to grow vegetables by artificial light, and while they have accomplished something in this direction, they have not been



VERY LITTLE LIGHT ENTERS THIS ROOM.

able to make any kind of artificial light which will do the work of sunlight. In the congested parts of all our large cities there are many rooms in which there is nothing but artificial light. Many of the houses in which the people live have too few windows. They could just as well have more windows, if they appreciated the value of them. Often one sees houses which are kept dark because of too many trees or other obstructions.

Most of the light in a house, except direct sunlight, comes from the sky. If you will look out of the window of your schoolroom or your house, you will find usually that it opens out upon the sky. If it opens out upon another building, there will probably be little light entering it. You can see, then, why, in building a house, one should plan the windows so that they will let in the sky, as it were. The amount of light that will come through any window depends on the way it opens to the sky, as well as upon its size. A window which is cut up into small panes will give less light than one large plate of glass.

If it is impossible to get light enough for a room through windows, then it can be helped somewhat by having the walls and ceiling painted white. Have you noticed that when a window opens upon another building, it will give very little light if that building is painted black, but if the building is painted white, the window may let in a good deal of light. How can you explain this?

The use of artificial light.

If people can do all their work by daylight, it will be best for their health and their eyes; but in these times most people do not like to stop their work when the sun goes down, and so they must use artificial means for lighting. In early times, torches and candles were the principal means of supplying artificial light. It is told of Abraham Lincoln that when he was a boy he studied in the evening, after his long day's work, by the light of the

fire and a pine knot torch. Do you think this would make a good light for reading and studying in the night time?

Do you know of any place now where candles are still in use? Are there many people in your community who use oil lamps? What is the most common form of artificial light in the city or country in which you live?

PERHAPS THE REASON THIS BOY IS BENT OVER SO BADLY IS BECAUSE THE LIGHT IS NOT GOOD.

In lighting a room, would it be better to have one strong light, say in the center of the room, or to have several lights of less strength in different parts of the room? Would there be any danger from having too bright a light? You know it hurts your eyes to look at the sun. Have you noticed that your eyes are likely to pain you when you try to read a page with the sun shining directly upon it? Have you noticed again whether an artificial light may be so bright that the eyes will be strained by it?

Perhaps you have noticed that when you are reading something or doing any near work, it is better to have the light over your left shoulder than directly in front

of your eyes. No one can look at a bright light without doing some injury to his eyes. Nature did not make the eye so that it could stand very bright light

ALWAYS HAVE THE LIGHT COME OVER THE SHOULDER.

coming directly into it. Frequently people injure their eyes in the early years so that they do not have much use of them in their later years. Often people get headaches and other troubles because they do not

take proper care of their eyes in doing their work or in reading. Men have recently found out that a soft amber-colored light is better for the eyes than a pure white light.

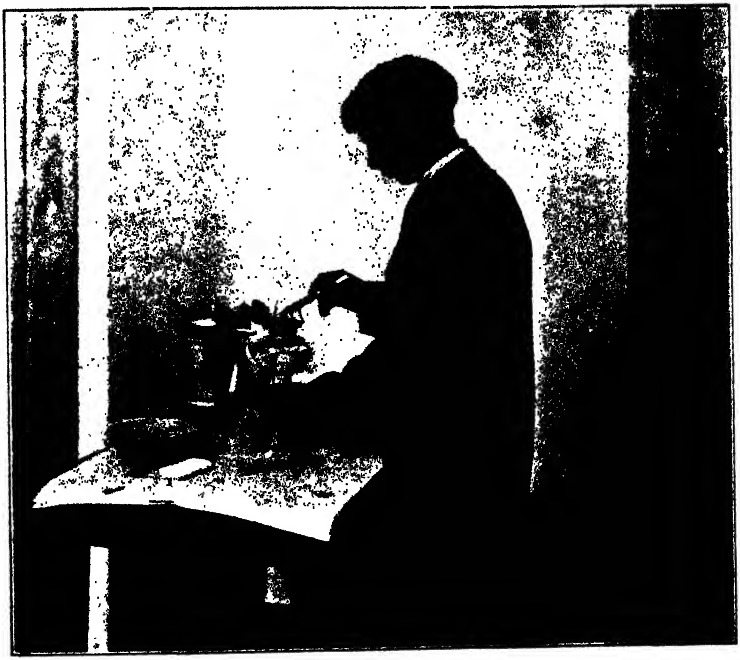
The unsteady candle-light bad for the eyes.

A flickering light is bad for the eyes. The reason for this is that one minute it may be quite bright, and the next minute it may be dark, and so the eye has to change so often and so rapidly that it overstrains the muscles that control the eye. Nature has made the eye so that when there is but little light, the *lens* expands so that enough light may enter, but when there is a good deal of light, it contracts in part so that the delicate membranes of the eye may not be injured by too much light. But if the change from light to dark be too sudden, the eye cannot adjust itself without great strain.

How to clean and care for a lamp.

Often one sees lamps in which the chimneys are not clean. It is especially important when an oil lamp is being used that all parts of it should be kept clean, in order to produce better light. A boy of my acquaintance, who tends to the sitting-room lamp for his mother every morning before schooltime, has a good way to keep it clean. First, he spreads a newspaper on the table on which he is going to work; then he brings the lamp, the oil can, a pair of scissors, an old knife, a basin of hot water, some soap, a round brush with a wire handle, some soft paper, a piece of flannel cloth, and another soft clean cloth which has no lint on it. When he takes off the chimney, he turns the wick just low enough to

show the burned portion. With the back of the old knife, he scrapes off as much of this as he can. If the edge of the wick is not left smooth and even, he trims it a little with the scissors, rounding the corners of the



How to clean a lamp.

wick slightly, so it will not flare up when it is lighted. Next he removes the top from the burner and wipes it clean with soft paper; then he fills the lamp with oil, always leaving at least one-half inch of space which

is not filled, because he knows that oil expands, and if he filled the lamp full, the oil might ooze out. Then he puts all the parts together, and wipes the outside of the lamp with the flannel cloth. Finally he washes the chimney in suds made of soap and hot water. Generally he uses the brush on it, and polishes the glass dry with a clean flannel cloth.

There are several grades of oil used for kerosene lamps, but only the best is safe. Lamp wicks should fill the burner, so that the flame cannot run down the wick into the oil. Suppose it should do so, what would happen? When half-filled oil lamps are left standing for several hours, gas may accumulate in the empty part of the reservoir holding the oil; and when the lamp is lighted, it may explode. When lamps have been left in this way, the tops ought always to be removed before lighting. I suppose you know that a lamp ought never to be filled with oil when it is lighted; yet a good many people try to fill lighted lamps. They may have no accident for a while, but sooner or later they are likely to be sorry for doing such a foolish thing. When the light is to be put out, the wick should be turned rather low, and one should blow *across* and not down the chimney. It is rather dangerous to leave a lamp turned low for a long time. If a lamp is needed at night, it is better to place it in some near-by room and have it shaded, rather than to turn it low and leave it all night.

A good many people are injured through lack of

knowledge in the care of oil lamps and gaslights. Every one ought to know that it is dangerous to blow out a gas flame. Gas must always be turned on with the key, and never be put out like a candle. The key should always stand square with the pipe when the light is turned off, or else the gas may leak. If a strong odor of gas is smelled in any room, one should always open the doors and windows before striking a match or bringing a light into a room. Sometimes people lose their lives because they do not take these precautions.

How to put out a gaslight.

Of all the methods of lighting in use to-day, electricity is the safest and most healthful. It is most like daylight. It is usually a strong and steady light. One good thing about it is that it does not use up oxygen in a room as do candles, lamps, and gas jets. It is important when any of these latter means of lighting are used to have good ventilation. It has been calculated that a gas jet, in burning power, uses as much oxygen as two persons. In the same way it has been calculated that a kerosene lamp will use up as much oxygen as four people.

Electricity the best artificial light.

Remember: It is impossible to have good health without an abundance of sunlight; and it is impossible to keep one's eyes in good condition unless he has a good, clear, steady light by which to read and work at night. It is best to do as much of one's work as possible by daylight, which is better for the eyes than artificial light of any kind.

Health Problems

1. Take a potato which is sprouting in a very dark corner of the cellar, and put it into the sunlight for two or three days. Then describe the change that you observe in the color and size of the sprouts.

2. Note how the people on the street where you live use the shades on their windows. Do they cover the top part or the bottom part of the windows? Say whether you think people generally follow the best plan in the use of their windows.

3. Observe what styles of windows are used in the houses on your way to school. Are the panes small, or do the windows have large plates of glass?

4. If you had a photometer in your schoolroom, do you think it would show that the windows let in all the light possible because they are perfectly clean?

5. From which direction does the light in your schoolroom come — from the front or the rear, over your right shoulder, or over your left? Is every corner of the room lighted equally well?

6. Does the direct sunlight ever fall upon your book as you are studying? If so, is this good for the eyes?

7. When you are reading or studying at home, do you have the light in front of you or behind you, or at your left or at your right? Where should it be?

8. Have you heard of any accident occurring from the use of kerosene oil? How did it happen?

Review Questions

1. What is the effect on the health of miners of their working underground during the daytime?

2. What is the effect upon the health of people who live in the deep valleys into which the sunlight rarely enters?

3. What is the effect upon the health of men who spend six months of winter in the Arctic regions?

4. What is the effect upon children who grow up in dark streets and alleys?

5. How is light admitted into our modern houses?

6. What is the best way to shade windows?

7. Why should the windows always be clean?

8. Tell the results of the test that was made in several schoolrooms with the photometer.

9. Should all living and sleeping rooms be situated so they can receive sunlight during each day? Why?

10. Why do people who rent rooms prefer those that face the sun?

11. Is it easier for dirt to accumulate in dark rooms than in light ones?

12. How do the people living in warm countries where very little light is admitted into the houses manage to get enough sunlight?

13. Would it be well for people in this country to cook their food and eat out-of-doors more than they do? Why?

14. Tell about the number of rooms without windows in New York City. Are there likely to be many such rooms in every large city?

15. What may prevent the light from entering a house in which there are a sufficient number of windows?

16. When a room does not have enough windows, or is situated so that it cannot get enough light from the sky, how may it be treated inside so as to increase the light?

17. What is meant by *artificial* light? What are the kinds of artificial light?

18. What kinds of artificial light were used in early times?

19. What kinds of artificial light are used mostly to-day in our cities?

20. What kinds of artificial light are used mostly in the country?

21. What is the best kind of artificial light?

22. What kind of artificial light uses up oxygen in the air most rapidly?

23. Why is good ventilation especially necessary when one uses gaslight or oil lamps?

24. Is it better to light a large room by means of one very bright light, or by means of several lights not so bright?

25. From what direction should the light come when one is reading or studying?

26. Why is a flickering light injurious to the eyes?

27. What care should one take to avoid accidents in the use of kerosene oil?

28. What care should be taken in avoiding accidents in the use of gas for lighting?

CHAPTER VII

Cleaning the House

If most of one's life were spent out-of-doors, it would not matter very much what sort of conditions he had in his house. But when one remains indoors much of the time, as most of us do, it becomes of first-rate importance that we should have clean houses. We have already seen why cleanliness is the first rule of health, and we must now see how we are to secure clean houses, whether it be a schoolhouse, or a home, or a store, or a shop, or the house in which we live and work. Can you think of any kind of house in which people live or work which should not be kept clean?

Keep the house free from dust.

In securing a clean house, to what should one first give attention? Probably everyone will answer, "To the removal of dust." It is pretty hard to get rid of dust, harder than to keep out litter of paper and similar things, and even pieces of mud. People can generally see large things that litter up a house, and they will try to remove them; but a great many persons are not sensitive to dust. It does little or no good simply to try to brush dust out of the house, because brushes and brooms usually just stir up the

dust and send it into the air, from which it will settle again on the objects in the room.

THIS BANANA PEEL WILL BE THROWN ON THE WALK, AND IT WILL BE GROUND INTO DUST SOONER OR LATER.

Many things help to make dust.

Have you ever thought of the number of things in the street that help to make dust? Usually when people think of dust, they think only of dry mud. But there are certain other things that make dust which may get into the house. For one thing, garbage carts help to make

dust. Sometimes the cans are so full that bits of rubbish fall off on the street, and are soon ground up into fine particles that fly about as dust. Dogs may bring bones around the house, and these are likely to be ground up to make dust. If you will watch horses as they are driven by, you will sometimes see foam and saliva dropping from their mouths to the street, and the dust is added to in this way. Careless people fling on the street orange peels, banana peels, tobacco quids, cigar stumps, apple cores, peanut shells, and gum they have chewed; and all these things may in time become dust.

In some parts of the city there are other things that contribute to dust, as fragments left from loads of manure, dead fish lost by peddlers, people's spitting on the walks or the street, and so on with other kinds of refuse. In the country, people sometimes throw waste from the kitchen around the back door, and this may dry and become mixed with the dust from the road, the fields, and the barnyard. You can appreciate, then, why the dust of the street is usually a pretty filthy thing. Dust in itself might not be so harmful to health, if it were not that all sorts of germs ride on dust particles, and so get into the lungs of people and into their eyes and other organs. Whatever one has on his feet when he walks on the street — shoes, boots, or rubbers — is likely to be covered with dust. If he lives in the country, and is in the barnyard, he is certain to have

his boots covered with refuse which never ought to be permitted to get into a house, so that it may become dust. In some countries, the people always leave their shoes and boots outside the door. Would it be a good plan if the people did that in this country?

Sometimes you will find people who do not think there is any dust in a house when the house is full of it. This is because the particles are so fine that they do not attract attention. But if one will make the following experiment, he will discover that in a room in which there does not appear to be any dust, there may be a great deal of it. On a sunny day, let the room be thoroughly darkened. Then cut a hole in the shade of the cloth which is used for darkening the window, in such a way that the hole will let in a ray of sunlight. If now you move around the room, and especially if you use a broom, you will probably observe a great amount of dust floating along or across the sunbeam. The dust which you see on the sunbeam is a sample of what can be found in all parts of the room.

Dust may get into the house in other ways than on one's boots and shoes or clothing. If one lives on a dusty street or road, a great amount of dust will be likely to blow in through the windows and doors, especially if the house is situated so that the street dust blows directly into it. Then the wood that is used in the house, and the coal, the ashes, the wear and tear on carpets and furniture, all tend to make dust in the house.

Do you know how your schoolroom is cleaned? Have you observed whether a plan is followed which enables the one who does the cleaning to *collect* the dust, instead of to spread it around? An inspector of school buildings reported recently that in many instances he found the way the cleaning was done each day was to sweep the schoolrooms in the morning before school, without putting anything on the floors. What would you expect would follow from this method of sweeping? In a schoolhouse I know, the pupils often write their names on the tops of the desks because so much dust has accumulated from the sweeping, that one can make marks in it. Do you think such a schoolroom would be a good place in which to keep one's health?

Dust in the schoolroom.

HOW SHOULD YOU LIKE TO GO TO SCHOOL IN SUCH A DUSTY SCHOOLROOM?

Here is an experiment that anyone may try, and he

will learn a useful lesson from it. Take a good, medium-sized potato, wash it thoroughly, and boil it until it is cooked through, but without breaking the skin. Your mother will probably let you have such a potato, which she has cooked for a meal some time. With a clean, sharp knife, which has been boiled, divide the potato into two parts, taking care not to touch the surface formed by cutting. The reason I am asking you to be so careful is because I do not want you to get any germs on the potato from the knife or from your hands. We are going to find out whether there are germs in the dust, and we do not want to get them from any other source.

Dust is the home of many germs.

ONE WAY TO SHOW WHETHER THERE ARE GERMS IN THE DUST IN A ROOM.

Now place the two pieces of potato, with the cut side up, in the center of a soup plate, and cover immediately with a large tumbler. Then take the broom and sweep the floor, carpet, or rug. When you have swept for half a minute, take the tumbler off from the pieces of potato, so that they will be exposed to the

air. Let them be uncovered for a moment, and then cover them again. Pour a glassful of water or so into the plate, and place it in a warm place, where it will not be disturbed. In two or three days you will notice that little spots begin to appear on the white surface of the potato. These are "colonies" of germs which came from the dust. You will notice as the colonies grow that they are of different colors, — some will be red, and others will be green or blue or yellow or brown or cream color or pearly white, and so on. The different colors are caused by the different kinds of germs, much as different kinds of weeds and flowers have different colors.

This experiment may help you to understand that care must be taken to keep down the dust in one's house. The best way to do is to *keep it out of the house*. This means that one must acquire habits of trying to get rid of the outdoor dust before it comes into the house. Dust clings to rough, fuzzy things more than to smooth ones. Silk and linen garments can be more easily freed from dust than woolen ones. Would you say that plush-covered furniture and chairs are good to hold and to catch dust? What about heavy curtains and carpets? Do you know of any house in which there is a good deal of furniture with much carving and fretwork? Would you advise such furniture in a house in which you wished to have as little dust as possible?

How to get rid of dust.

I have in mind a house that was built in such a way

that it is comparatively easy to keep it quite free from dust. For one thing there are few angular corners. They are made round. The walls of this house are finished smooth and painted in soft colors. This is much better than paper on the walls. The woodwork in the house is very plain, and there are no cracks in the floor where dust may hide. The floor is made of hard wood, and you can hardly tell where the pieces are put together. Best of all, the surface of the floor is polished so that no dust can cling to it; and if there is any dust on it, it is easily seen. The floor is not covered with carpets, but instead there are a few rugs, which are often taken out of doors and cleaned and aired. The chairs and tables in this house are "built on straight lines," as the furniture man says, instead of being grooved and carved.

There are cushions in this house, but they are covered with smooth instead of fuzzy cloth. The covers can be easily removed and cleaned. There are photographs and books and some bric-a-brac in this house, but they are for the most part in closed cases, so that the dust cannot settle on them. The lady to whom this house belongs told me that all the curtains can be washed without doing them any injury. Any one would say that this house is comfortable, convenient, and beautiful; but it is also clean, as many houses are not.

When the air is still in a house, the heavier particles of dust, which usually carry germs, settle on the flat

surfaces in the room, as the chairs, the tables, and the floors. Dust settles more largely during the quiet hours of the night than at any other time. Whenever there is much moving about in a house, these particles of dust begin to whirl through the air again. The lady to whom I referred above knows very well that

THERE ARE NOT MANY ARTICLES IN THIS ROOM TO CATCH AND HOLD DUST. NOTE THE SUCTION SWEEPER. HOW MUCH BETTER THAN A BROOM!

the best time to get rid of dust is to catch it before people begin stirring about in the morning. She gets the dust from the rug by catching it up with a suction sweeper. She goes over the polished floors with a dust mop or a cloth placed under a long-handled brush, or with a broom covered with Turkish toweling.

The dust on the furniture is removed with a dustless dust cloth. This lady takes special care not to set the dust swirling before she has a chance to gather it. When she gathers the floor dust, she puts it in a newspaper and burns it in the furnace. The dust cloths, mop

Going over the polished floors with a cloth under a broom, so as to gather the dust, and not stir it up simply.

and broom cover are frequently washed or boiled, and dried out of doors so as to keep them clean.

Fortunately, this lady lives in a city in which the streets are kept well cleaned. Four times a day they are sprinkled, in order to prevent the dust from becoming dry enough to blow around. Best of all, while people are asleep, the streets are washed clean with

water taken from the hydrants. Any person who lives in a town or city where the streets are not kept clean in this way will have a harder time to keep his house clean.

There is another lady, a neighbor of mine, who knows how to keep dust out of her house. She has no suction sweeper, but before she starts to sweep the floor or the carpet, she moistens pieces of newspaper, and spreads them over her carpet, because she knows that these will hold the dust, and keep it from flying about. She has carpeted steps, and she uses a damp whisk broom for these, brushing the dust from one step at a time into a dust pan covered with moist newspaper. She brushes each one in this order,--the riser, the angle, and the tread. She wipes the bare stairs with a dust cloth, which she makes moist by sprinkling it. When she is through cleaning, the broom and brush are shaken, washed, and kept in the sunlight until needed again.

This lady knows that dust is likely to settle especially upon beds, so she puts a clean sheet over each bed at night. In the morning she lifts this carefully, takes it out-of-doors, shakes it, and hangs it in the bright sunlight for the day. She uses this for one week, and it is then put into the wash.

You will be interested to hear that my neighbor will not permit muddy shoes and rubbers to remain in her vestibule, nor to lie on the floor of the clothes closets. Neither will she allow dusty wraps, skirts, or trousers to be hung there. She knows that beating rugs on

the porch, and shaking dust cloths outside the door or window, is of little use, because the dust may be brought back into the house again with the next breeze. What my neighbor tries to do is to *catch* the dust, not to scatter it around in corners or other places in the belief that she is getting rid of it by so doing.

There is in this house a baby who likes to creep about on the floor. The mother knows that the floor is the place where dust settles more than anywhere else. She knows that the baby's hands, which have to be on the floor when it creeps, are likely to get into its mouth and eyes and nose very frequently. How does the mother solve this problem? She does it very easily. She pins large clean sheets over the carpets, and the baby then has a really safe playground.

Have you ever seen a dust storm? In some dry countries these storms last for two or three days at a time, and they are extremely uncomfortable. But if you wish to, you can make a little dust storm in your own house. You can take a broom and go to sweeping the carpet or rug or even the floor on which considerable dust has accumulated. The broom will carry before it some large dirt particles, but it will gather almost no dust. What it really does is to spread the dust all over the room. Every stroke of the broom will start the dust flying into the air. If the sweeping be done on a carpet, some of the dust will be pushed through its meshes, and there will be an accumulation underneath, from which some particles of dust will rise into the air

every time there is a footstep or other movement on the carpet.

Some experiments were made by Dr. Pruden. It was found that from the still air of a room before sweeping, only seventy-five bacteria settled upon a culture plate, which you know is so prepared that bacteria will grow readily upon it. But immediately after sweeping the room, Dr. Pruden found that 2700 bacteria settled upon the plate.

The leaves of plants are moist, and hold dust as other moist things do. In the summer time, you must have observed that the plants by the roadside are often so covered with dust that one is hardly able to tell that their leaves are green. But if you will notice them after a shower, when the rain has washed the dust away, you will see that they are really dust catchers. Now the plants that we keep in pots in our homes will help us to test whether our house is as free from dust as it should be. If we see that the plant leaves are thickly covered with dust, we may know that, for some reason, there is too much dust in the house.

Remember: Bacteria use dust particles on which to travel about from place to place, and if the dust cannot be kept out of the house, one is likely to be taking bacteria into his eyes, nostrils, mouth, and lungs constantly; and it will be a wonder if some of them do not grow and give him pain and sickness. The thing to do is to keep dust out of the house, and whatever gets in, to collect and destroy it. Be careful especially not to scatter it

around, after it once settles on the floor, carpet, beds, tables, books, or furniture.

Health Problems

1. Keep account of your habits for a week, and note how many hours a day you spend in the house, and how many hours you spend out-of-doors. Is it different in summer as compared with winter?

2. What efforts are made in your neighborhood to keep down the dust from the walks, or the streets, or the road, or the barnyard, or whatever else helps to make dust?

3. Is there any officer where you live whose duty it is to see that streets and walks and roads are kept clean? Does he do his work well?

4. Are there a good many sharp corners in your school building, or are they rounded? If there are sharp corners, do you know whether the dust is always swept out of them?

5. Are the houses that you know built so as to make it easy for dust to collect, or so as to make it easy to get rid of it?

6. Are they furnished so as to make it easy to keep them clean?

7. Suppose you see a man on the street in front of your house trying to sweep without sprinkling the street or the walk. What would you say to him? Could anything be done to make him be more careful?

8. How do the people in your neighborhood clean their houses? Find out if you can whether they use dustless cloths, and whether they put anything on the floor to collect the dust when they sweep.

9. How do people clean their rugs and carpets in your neighborhood?

10. How many houses you know get the dust out by means of vacuum cleaners? Why should a vacuum cleaner be better than a broom for sweeping?

Review Questions

1. Why is it necessary that our houses should be kept clean?
2. What is the first thing to do in keeping a house clean?
3. Why may sweeping or brushing not keep dust out of the house?
4. What should one do to his shoes, boots, or rubbers as he enters the house?
5. Why is dust likely to be so harmful to good health?
6. Tell about the experiment which will show that there is dust in the house.
7. What sort of habits will help to keep dust out of the house?
8. From what sort of curtains can dust be collected most easily?
9. Describe the kind of furniture that can easily be freed from dust.
10. Describe the kind of floors that can be kept free from dust.
11. How should carpets or rugs be cleaned?
12. Are rugs better than carpets for the house?
13. How frequently should rugs be taken out-of-doors, and the dust whipped out of them?
14. What kind of covering is best for cushions and sofas?
15. How should dust be removed from furniture, such as tables, chairs?
16. How should beds be protected from dust?
17. How can a good healthful play space be made for a creeping baby in the house?
18. Are the leaves of plants good dust catchers? Why?
19. How can the plants in our houses show us whether there is much dust or not?
20. How should schoolrooms be swept?

CHAPTER VIII

Caring for the Wastes of the House

I suppose it is not necessary to say anything more about the cleanliness of the house in order to make you see how important it is. You probably also realize by this time that it is very desirable to have clean environments. Unless we can get rid of dirt inside and outside the house, we may at any time be attacked by some disease which will cost us time, money, strength, and good feeling. So you see that those who live under clean conditions have a better chance for good health than those who are surrounded by dirt and filth.

Collections of refuse a menace to health.

In this chapter we must give our attention to ways and means of taking care of the refuse which is all the time coming from the house. The various kinds of work that have to be carried on in the house nearly all produce more or less waste matter. Take for instance the soiled water which has been used to wash the dishes, or the floor, or the windows, or the woodwork and so on in the house. Then there are the ashes which are formed by the burning of the wood and the coal. In almost every house, clothes are made or mended, and there are bastings and scraps left after the garments

are completed. Have you noticed how much waste there is from the foodstuffs that are brought from the market? Have you ever thought of what becomes of the shells of eggs which have been eaten or used in cooking?

Then there are the peelings of vegetables and fruits, and the seeds, stones, scales, and bones that cannot be used for food. Think next of the paper bags, the boxes, and the tin cans in which supplies are brought into the house. These are only a few of the things which make up the refuse or waste which must be got rid of in some proper way, or else the house will soon become filled with rubbish. Much of this waste is stuff which will quickly rot; and if it be left on the top of the ground near the house, it is almost certain to become a source of disease to some one.

You have already learned that primitive people, like our Indians, lived in tents and wigwams. Now, these primitive people were not very careful about the way in which they disposed of their waste or refuse. They either dropped it on the ground in the tents or threw it away outside; but they never made an effort to get rid of it, so it would not cause ill health. When the accumulation of waste became so great that they could not endure it, they would take up their tents and move into a fresh, clean place. But we cannot move our houses away from our refuse, even if it accumulates at our doors so that it becomes very offensive. Instead of going away from our refuse

It is a great problem to dispose of the waste of a large city. New York City carries some of its refuse out in the river on scows.

ourselves, we must take the refuse away from our houses. This is sometimes not an easy thing to do. But for a long time people have been studying the best way to get rid of waste and refuse from houses, especially in the city.

The two classes of waste.

You must learn at this point that there are two main classes of waste. You know that the waste from meat, vegetables, moldy bread, or anything of this kind, will quickly rot or decay if exposed to the air. Waste of this sort is called *organic*, which means that the matter was once living. But when it no longer has life in it, it will decompose. Of course, when it decays, it will breed germs, and it may be the cause of trouble. Then you know that there is another kind of waste, like old iron, bottles, tins, ashes, paper, and the like, which will not rot or decompose. This sort of refuse is called *inorganic*, because it never had any life in it. This latter kind of refuse is harmful to health, not because it will breed germs, but because when it accumulates it will collect dust and harbor filth of various sorts, and in this way it may furnish a place for germs to thrive.

Using inorganic waste.

There are ways in which some of the inorganic waste like tins, old iron, and so on, which often litter up the back yard, may be put to good use. Wood ashes, for instance, which often make the back yard unsightly, could be used for fertilizer in the fields. A farmer would be glad to get wood ashes. Coal ashes are not good for fertilizing the fields, but

they may be used to fill up low places and to make hard, dry walks. In many cities the ashes are carefully collected and are used to make new ground in marshy places.

In New York City this sort of refuse is considered of value, for it is being employed to make new ground adjoining Riker's Island in the East River. The way in which this is done is interesting. As the ashes are gathered from each house, they are carted away in covered wagons so the wind cannot get at them to blow them about the city. They are carted to the river front, and there they are loaded on flat-bottomed boats and taken over to the island which is being enlarged. Enclosures have been built around the island a little way out from the shore, and the ashes are dumped into these enclosures and packed down until they make a heap extending seven or eight feet above the water. Then a layer of good soil is spread over the top of this heap, and grass, flowers, and trees are planted on it. If the soil is deep enough, it will grow all sorts of grasses, flowers, and trees luxuriantly. Is not this a better way than to let the ashes accumulate in the back yard? The land which is made with ashes in the way described above is always hard and dry and healthful.

If you have not thought of the matter, I suppose you will say that no use can be made of old tin cans; but they are now being used to cut over for toys. Many people think old rags and paper are utterly valueless; but they can be used very profitably in the making of

new paper. Cinders mixed with cement make very good floors. So we could go on to mention other ways in which most of the inorganic waste of the house can be put to new uses. But if there is anything which cannot be used again for any purpose, it ought to be destroyed at once. If it be thrown into the back yard and allowed to remain, it will almost certainly gather dust or filth and become a nuisance.

How to get rid of useless refuse.

What do you think is the best way to get rid of rubbish that cannot be put to any good use? You will probably think of burning the waste that can be treated in this manner, and this is doubtless the very best thing to do. Do you think you could burn any of the organic wastes which were mentioned above, such as the parings from vegetables, the bones from meat, scraps from the table, and so on? Certain kinds of stoves are now made which are designed to burn this kind of waste. If it is not too wet, it will burn quite readily. Some people, wishing to burn this kind of waste, dry their potato parings and other food waste on the back of the stove on the flat place just over the oven. If there is not a great deal of it, and if it can be burned as fast as it accumulates, this is a very good way to get rid of it. It is destroyed in this way, and it furnishes heat, though not a great deal, of course, which can be used in cooking and in warming the house.

If there be a garden away from the house, the food waste can be buried, and this is a good way to get rid

of it because it will enrich the soil. The following is the proper way to bury it: three or more holes, several feet deep, should be dug in the garden, and each hole should be used every third or fourth day. After the food waste of one day is emptied into a hole, enough dry earth should be thrown over it to cover it completely. Sometimes people do not take enough pains to cover over the refuse, and as a result it becomes a source of trouble.

Is this a good way to get rid of kitchen waste? Notice the well from which the drinking water for the family is drawn.

You must have noticed that wet garbage thrown out upon the top of the ground will soon rot. It will then send forth foul odors, which will be not only unpleasant, but also dangerous to health. We can appreciate then that such a place is not a desirable one in which to stay. How should you like to live in a place which was filled with offensive odors from decaying refuse from your

own or from a neighbor's house? The worst thing about this decaying garbage is that *it attracts flies.* They feed upon it and cover themselves with it, and then make a visit to the house to see what they can find in there of interest. You know that flies are pretty industrious in investigating everything which is exposed in the house. If they come in from decaying refuse, they will bring some of it with them, and deposit it upon the food in the house and whatever they light upon. If for no other reason, then, refuse should not be allowed to decay near the house.

In most towns and cities to-day there are special collectors whose business it is to collect the refuse or garbage from each house at regular times. There is usually in each town and city some special way of disposing of the refuse, but we shall see more about this later. In order that the garbage which is waiting for collection should not be a danger to health, it is necessary that it should be kept in some metal can that is perfectly smooth inside, and furnished with a tight-fitting lid. Of course it should always be kept covered, for if it is not the garbage will decay, just as if it were thrown out on the top of the ground.

It is important, too, that the can should be made perfectly clean each time after the refuse is emptied from it, before it is used again. Why do you think it is important to be careful about this? Do you think it would be enough merely to rinse the can with cold water as some people do? You should know that while

rinsing may remove the fragments which stick to the sides of the can, still it does not destoy the germs that are always multiplying in refuse. The germs could ask no better place than a garbage can in which to flourish, and they could not object very much to a mere rinsing with cold water. But they are mortally afraid of soap and water, and especially of *boiling* water, because they know that when they are treated in this manner, they will probably be put out of existence speedily.

NOTHING BUT BOILING WATER WILL RID GARBAGE CANS OF GERMS.

In cleaning the refuse can, then, it is necessary first to put boiling water in it. If soap or soda be added, the water will be made much more cleansing. When the can has been scalded, it should be left to dry in the bright sunshine before being put to use again. We should not forget to mention the fact that those who empty the waste into the garbage can, or who take it from the can into the collecting wagons, should be

very particular never to scatter fragments of it on the ground around the can, nor to leave smearings of it on the edge of the can. If those who have anything to do with garbage will keep in mind that it must all be kept in a can covered from the air and the flies, there will be no danger from it. But thoughtless people can be the cause of a good deal of mischief due to the careless handling of this organic waste. Do not forget that all organic waste decomposes readily and furnishes breeding ground for germs.

Keep the back yard clean.

One day recently I passed a pretty cottage nestling among high spruce and maple trees. Over the porch I noticed beautiful pink roses. Everything in the front of the cottage was very neat and attractive. At the side was an orchard of fine old apple trees. As I had been walking some distance along the road, I was thirsty, and I went up to the door of the cottage to ask for a drink of water. A little girl led me around to the pump at the back of the house, which was the source of water supply for the family. From what I saw in front of the cottage, I felt sure that I should find a grassy lawn with shrubs and flowers behind the cottage. Imagine my surprise and disgust when I really saw a great muddy hole on one side of the kitchen steps. The people in the house had been accustomed to throw their dish-water out of the door, and this had been done so often that it had made deep holes, and had killed the grass for some distance around. These holes were swarming with

flies. Of course, you know that dish-water always contains fragments of food washed from the silver and the dishes. Flies and bacteria like such water as much as they do garbage. I have never seen a house in which dish-water is thrown out on the ground that it does not soon attract flies from far and near.

Disposing of kitchen slops.

What is a safe way to dispose of kitchen slops? There must be some arrangement by which they can be carried through pipes into a drain or a sewer. In these times, every house ought to have a sink with which is connected a pipe called a *waste pipe*. This pipe leads from the sink into a drain; or if the house is in the city, the pipe probably connects with the street drain or sewer. But it is not very much trouble to build a drain in the country, so that the kitchen water may flow into it from the sink.

Of course, this makes the work of the house much easier for the people in the kitchen. But more important than that, it prevents the spoiling of the air by throwing the slops out on the ground. People who live in the country, and who have no drain, sometimes use a large covered barrel set on wheels. Every night it should be wheeled away, emptied in some suitable place, and then cleaned for the next day's use. If the people who care for this do not neglect their work, and if the barrel is always kept tightly closed, it will answer quite well for the disposal of the waste water from the kitchen.

In kitchens where there are sinks, the water generally runs through a strainer into the waste pipe. This strainer ought to separate any fragments of food or bits of other solid things which would clog the pipe, if they should get into it. People have to be very careful about this, or they will be in constant trouble with the stoppage of their waste pipes. When this occurs, it

DO NOT LET WASTE ACCUMULATE.

will be a great annoyance, and if it continues long, it may be unhealthful. Sometimes the kitchen water contains so much grease, which becomes solid as it passes through the cold drain pipe, that it coats the inside of the pipe, and it may become so thick that it will stop the flow of the water. A good way to prevent this from happening is to pour some hot *sal soda* water down the pipes at least once a week. A still better plan is to wipe the grease from the dishes with pieces of soft

paper before they are put into the water. The paper used in this way should be burned. It should be remembered that a sink as well as a garbage pail constantly invites flies and germs unless it is kept entirely clean.

In some places the organic waste from the kitchen is kept as food for cows or for pigs. Of course, when the refuse is to be used in this way, it must be kept in clean cans. The quality of the cow's milk depends on her food, and the same is true of the flesh of pigs. The animals that are used for food ought never to be fed on rotting or decomposing stuff of any sort. Sometimes one can observe pigs that are fed on decaying refuse, and it is not surprising that their flesh becomes diseased when they are treated in this way.

REMEMBER: All waste and refuse should be got rid of as soon as it is made or else it will become a menace to health or will clutter up the house and the yard, and will decay and furnish nourishment for flies and bacteria. Or it may become a dust catcher and breeding place for germs. A house cannot be healthful unless all of its waste is put to use in some way, or destroyed by burning or by removing to some place where it can be used or treated so that it will not be harmful.

HEALTH PROBLEMS

1. How are the *organic* wastes in your house taken care of?

2. How are all the *inorganic* wastes cared for? Do the neighbors care for their inorganic wastes in the same manner?

3. If there is a garbage collector where you live, do you know how he cares for garbage? Will he take inorganic as well as organic waste?

4. What do the people in your community do with their coal ashes? If they have wood ashes, how do they dispose of them?

5. Why do so many people who have attractive looking houses in the front have such unclean and filthy back yards?

6. If you have a neighbor quite close to you who has a garbage can or a slop barrel that gives forth foul odors and breeds flies, what do you think should be said to him?

7. Is there any law in the town or city in which you live that prohibits the throwing of organic refuse out on the top of the ground? Do you think such a law would be a good one and ought to be enforced? Why?

Review Questions

1. Mention some of the wastes that come from the house.

2. What are the two principal kinds of waste?

3. Mention some of the *organic* wastes.

4. Mention some of the *inorganic* wastes.

5. Which of these two kinds of waste is likely to be most harmful to health? Why?

6. How can some of the inorganic wastes be put to good use?

7. How can ashes, for instance, be made of value. How are ashes being used in New York City?

8. Why should inorganic waste not be allowed to accumulate in the house, in the cellar, or in the back yard?

9. Is burning a good way to get rid of some of the waste? Why?

10. Can the organic waste be burned? How? Is this a good way to get rid of it?

11. If the organic waste is buried, how should it be done?

12. What are the chief dangers which come from rotting garbage exposed to the air and the flies?

13. How is garbage disposed of in most towns and cities to-day?

14. How should the garbage be cared for while it is accumulating for the garbage collector?

15. Tell how the garbage can should be cared for in order to make it safe for the health of the people in the house.

16. What care should be taken in emptying garbage into the can, or from the can into the collecting cart?

17. What is the safest way to dispose of kitchen slops?

18. What becomes of the kitchen water which is put into the sinks in the houses in a modern town or city?

19. How can people in the country provide for the disposal of their slops in a safe way?

20. What care should be taken to prevent the clogging of drain pipes?

CHAPTER IX

Disinfecting the House

All last winter there was a sick man in a house just across the street from where I live. In the spring he moved away. Soon a new family came into that house. They washed the windows, scrubbed the floors, cleaned up the yard, and made things in and around the house seem very neat and clean. They were nice, tidy people. The neighbors liked them; and we all felt very sorry when, about four weeks after they moved into the house, one young girl, a member of the family, became so ill that her doctor said she must take the "fresh-air cure," and all the household went with her to the country to stay.

Why houses need to be disinfected.

Soon another new family came to live in that house. Within a few weeks, one of its members became ill with the same disease that the man and the girl had. Then it became plain that there were some of the bacteria that cause that disease lurking about somewhere in the house. It was plain, too, that scrubbing and the usual methods of cleaning did not destroy them. The man who owned the house was told by

the health officer in our city that it must be *disinfected.* To *disinfect* is to do something to a thing or a place that will kill all the germs in or about it.

There are various ways of doing this. It is well for everybody to learn how it can be done, but it is not wise for any one but a person who is very careful and painstaking to attempt it. In cities, the health department employs to do such work only men who have been specially trained for the business. One may be sure that when the disinfecting is done by a *disinfector* it will be done well.

SEALING UP A ROOM SO THAT DISINFECTING GAS CANNOT ESCAPE.

How to disinfect a house.

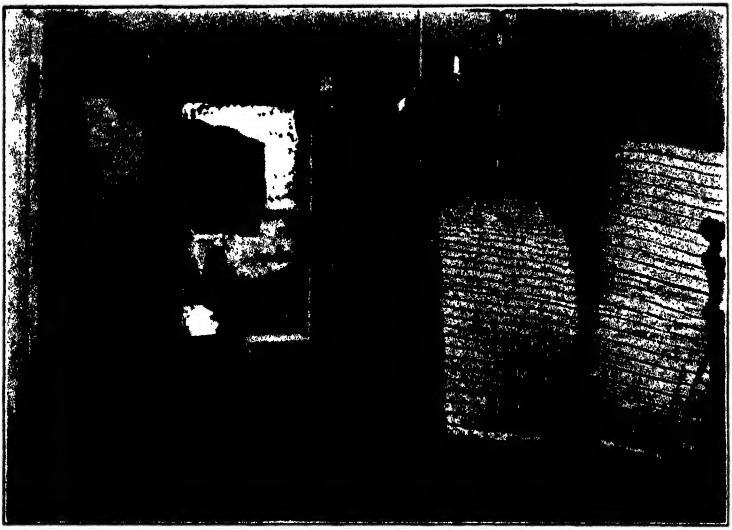
When a house or a room needs disinfecting, certain gases which readily kill disease germs are used for the purpose. The gas from burning *sulphur* or from *formaldehyde* is the most commonly used. Like air, a gas of this sort enters all parts and portions of a room and all its contents, and in this way it gets at every germ wherever it may be

in hiding. In order to keep the gas strong enough to destroy all germs, none of it must be allowed to pass out of the room or the house. So the house is first sealed up by pasting strips of paper along the cracks of windows and doors and over keyholes. A fireplace, stovepipe hole, or any other opening through which gas might escape must also be sealed. Doors between rooms must be swung wide open if all the house is to be disinfected. Closed cupboards, wardrobes, and drawers must also be opened up in order to admit the gas to the inside.


Preparing to burn sulphur in order to disinfect a room.

In order to burn the sulphur, place a metal tub in the most central room in the house, and fill it with water to the depth of about an inch. Put into the tub two bricks laid flatwise, and near together. Set an old iron kettle upon the bricks, and into this put equal parts of sulphur flour and charcoal pounded fine. The amount of sulphur needed is four pounds for each 1,000 cubic feet of air space. Mix a few bits of newspaper with the sulphur and charcoal. When all is in readiness, touch a match to the paper to start

the burning. As soon as it is evident that it will burn well, leave the room and seal the door. Keep the house sealed for twenty-four hours. The fumes from the sulphur can be made to work best by boiling water for an hour so as to fill the room with steam before



EVERYTHING IN THE ROOM MUST BE ARRANGED SO THAT THE DISINFECTING GAS CAN GET AT IT.

burning the sulphur. If this is not convenient, spray water around the room and over the furniture just before the sulphur is lighted.

For a room or house in which there is furniture, bedding, curtains, or clothing to be disinfected, it is better to have *formaldehyde*[*] gas. This does not tarnish

or change the color of things as sulphur fumes sometimes do. Prepare the room by sealing all cracks and openings, just as in using sulphur. Suspend the clothing, blankets, and similar articles from a clotheslines stretched across the room. Pull all furniture away from the wall. Stand up mattresses on end, and shut all registers. When everything is ready, have a coarse cotton sheet upon a clothesline stretched across the center of the room and sprinkle this with a 40 per cent solution of formaldehyde gas. A florist's rose sprinkler is just the thing with which to do this, and eight ounces of the solution is about what one sheet will hold without dripping. A sheet sprinkled in this way is required for every 1000 cubic feet of space in a room. How many sheets would be needed in a room 30 feet long, 20 feet wide, and 12 feet high?

It is necessary to do the sprinkling in haste, and then immediately to leave the room, close the door, and seal it from the outside. Even the keyhole must not be overlooked. At least ten or twelve hours should elapse before the room is opened. Then after it is well aired and cleaned, it is ready for use. Schoolhouses, shops, and other buildings, and ships, which may at times be in need of disinfecting, can be disinfected easily with sulphur or formaldehyde gas.

Would you be willing to occupy a house in which other people had been living, without first making it clean to the sight, and removing all litter and rubbish? Do you think one who is wise will take care to have

a house into which he is moving disinfected as well as cleaned? One can never be sure that there are no disease-causing bacteria about until he knows they have been destroyed.

Strong sunlight will disinfect a room or a house. A bottle was recently filled with disease germs and put in the hot, bright sunshine. In three hours the sunshine had killed all the germs. If we lived in glass houses and allowed the sunshine to come in freely, we should probably not need often, if ever, to use other means of disinfection.

Other means of disinfecting.

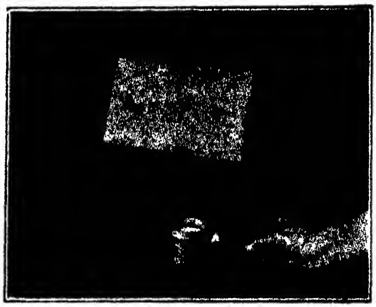
From this we can see the value of many windows and much sunlight in all our rooms. Often things needing to be disinfected can be taken out of the house and put in the strong sunlight.

SOME THINGS CAN BE DISINFECTED BY BAKING IN AN OVEN FOR AN HOUR.

Articles that cannot be harmed by boiling may be disinfected by covering them all over with water and boiling them for half an hour. For some purposes, steam under pressure (find out what this means) is better than boiling water. Glass, earthen ware, and objects made of metal may

be disinfected by baking in a hot oven for an hour. Articles of little value suspected of having harmful bacteria should be burned — especially old clothing, bedding, and rubbish.

Many times a bad odor will show us where there are germs needing to be destroyed. Some people imagine that when there is a smell from the cesspool coming up through the kitchen sink pipe, a saucer full of *chloride of lime* placed in the sink will correct the matter. But chloride of lime has such a strong odor that it may conceal the other smell without destroying the germs. Made into a solution (one pound to twelve gallons of water) and poured down the pipes in large quantities, it will serve very well. Do you think that merely to disguise an odor will correct the trouble? Many patent stuffs sold as disinfectants only conceal bad odors.

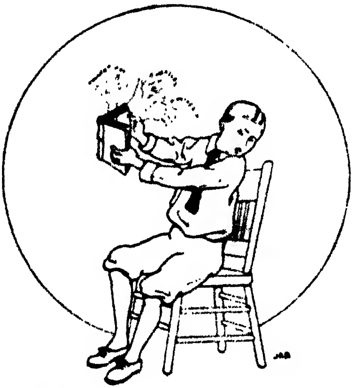


DISINFECTING A BOOK.

Disinfecting books. Books and pamphlets are about the very hardest things to disinfect, and in many cases it is best to burn them. Books owned by a school and used first by one and then another pupil need frequent disinfection. One good way to do is to suspend the books by their covers with their leaves all

widely spread apart. A formaldehyde candle burned underneath them in such a way that the gas will reach every part of the books will disinfect them very well.

Some men in Germany recently tried an experiment. They removed the most soiled portions from free text-books that had been used for a time in a common school. Then they soaked these parts in salt and water. When the water was given to some guinea pigs, more than one-third of them became sick with tuberculosis. Such an experiment makes the danger from old second-hand books very plain. Remembering the things you have already learned, do you not think this danger would be much less if every pupil had clean hands, and took care never to wet the fingers with saliva in turning the leaves of a book?



BEFORE USING SECOND-HAND BOOKS ONE SHOULD BE SURE THAT THEY DO NOT CONTAIN DEADLY GERMS.

REMEMBER: Sick people often leave behind them in the houses in which they live the germs which caused their disease. These germs may live for a long time, and cause disease in well people who come into the house, so that all houses in which sick people have stayed should be disinfected before others come to live in

them. Second-hand clothing, books, and the like should always be disinfected before being used again.

Health Problems

1. Suppose a pupil in your school comes down with scarlet fever and is kept at home for six weeks or so. What must be done to his house, his clothing, his books, etc., before he is allowed to come back to school? Why?

2. Has your home ever been disinfected? How was the work done?

3. Has your school ever been disinfected? If so, why was it done? Would it not have been enough to scrub the floors and the seats? Why?

4. Do you know what some cities do with textbooks that have been used by one pupil before they are permitted to be used by another? Why? Is it a good plan?

5. People always say they can tell when they enter a hospital by the odors? What do the odors come from, do you think?

6. What is the meaning of a "40% solution" of anything, as formaldehyde gas, or sugar, or salt, or what not?

7. Why do physicians say that rooms or houses in which there has been disease must be opened up as fully as possible to the sunlight and the air?

8. Do you think one would catch such diseases as tuberculosis, diphtheria, and the like if he lived in a tent on the top of Pike's Peak, provided he had enough good food, and was always comfortably warm?

9. Physicians say that all articles of clothing, bedding, etc., used by persons sick with any contagious disease must be boiled as soon as they are removed from the sick person, and before any well person comes in contact with them. Why?

10. What is meant by "steam under pressure"? Give some

everyday illustration. Why should steam under pressure be a good disinfectant?

11. If you can do so, bring to the class small samples of (*a*) sulphur; (*b*) chloride of lime; (*c*) formaldehyde.

Review Questions

1. How can the germs that cause diseases lurk around a house even after it has been washed and scrubbed?

2. What does *disinfecting* a room or a house or a thing mean?

3. What person, in many cities, is connected with the health department for the purpose of disinfecting houses?

4. Describe the way in which a house may be disinfected with sulphur.

5. What must be done to closets, cupboards, and so on, in order that they may be disinfected?

6. How much sulphur should be burned in order to disinfect an ordinary-sized room?

7. What is the best way to disinfect a house in which there is furniture, bedding, curtains, and the like?

8. Tell how to disinfect clothing, blankets, and similar articles.

9. Is it as necessary to disinfect a house into which you are moving as to clean it of rubbish and litter? Why?

10. Is it necessary to disinfect schoolhouses and other buildings often? Why?

11. What is a good disinfectant which every one can have for the asking?

12. How can one disinfect articles that will not be injured by boiling?

13. Why is baking a good way to disinfect earthenware, tinware, and the like?

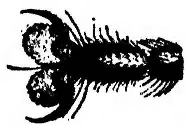
14. What should be done with old clothing and rubbish that are suspected of having harmful germs?

CHAPTER X

A Disease Carrier — the House Fly

Have you ever looked at a house fly under a microscope? If so, you probably noticed that it was a curious little creature with two wings, a body with three divisions, six hairy legs, and wonderful feet, looking much like the claws of a crab. A pair of pincers at the end of the claws enables the fly to cling to uneven surfaces. Spongy pads on each foot make it easy for the insect to adhere to smooth surfaces and even to walk on the ceiling. The accompanying picture of a fly, many times enlarged, shows very well how it is made.

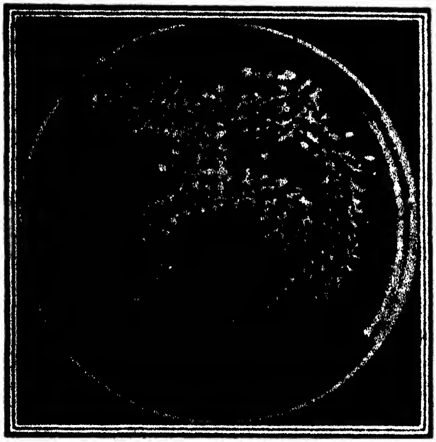
Flies are germ carriers.



The foot of a fly.

With such legs and feet, it is impossible for a fly to walk in or on any sticky material without getting more or less of the stuff on itself. If the fly always took its walks on things in places clean and wholesome, it would not matter very much. But the fly is one of Nature's *scavengers*, and it feeds on filth. So it has to walk among all sorts of foul stuffs in order to make its living. Bear in mind, also, what we have already

learned, that germs of many kinds abound in filth. Then it will be plain how it happens that the fly generally has an army of germs on each of its six feet. The parts of its mouth, also, which are made for lapping and sucking, get smeared with its filthy food. Its wings, too, catch germs as they brush against filth wherever the fly alights to feed. So the fly gets well covered with germs; and as it flits about from place to place, it carries them along. One fly was found in a recent test to have 6,600,000 bacteria on itself. That seems a big load for a little fly to carry; but one such germ is as much smaller than a fly as a fly is smaller than an elephant.

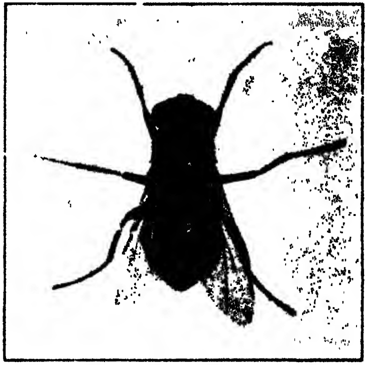


A FLY WALKED OVER A "CULTURE" PLATE, AND LEFT THESE BACTERIA, WHICH ARE GROWING AT AN ENORMOUS RATE.

The fly does not seem quite to enjoy being loaded down so heavily with filth and bacteria. If you watch one for a time, you will see it rub off the dirt, and polish its feet, wings, and mouth with great care. The trouble about this is that it does not care where it does its cleaning; and it is just as likely to wipe

its feet on a lump of sugar or on the berries in your saucer, as anywhere else.

The fly is fond of the foods we eat. When they are cooking on the stove, it smells them from afar; and, if a way is open, it will come in through a window, or descend through the fireplace chimney to get a taste for itself.



THE FLY, AN INNOCENT-LOOKING BUT A HARMFUL INSECT.

The fly has many more eyes than we have, although they are very imperfect ones. But it has a keen sense of smell, and it hunts its food by means of odor alone. Strong smells of many sorts appeal to it. So it may happen that at one moment it will saunter over dead animals or decaying garbage in search of a morsel to eat, while at the next moment, attracted by the pleasant smell in the dining room, it will be nibbling at the dinner upon your table, leaving a trail of filth and germs upon everything it touches.

The fly has a peculiar appetite. It is fond alike of the daintiest foods and the most filthy ones. It is a continuous eater. It always is hungry. But its stomach will not stretch to admit everything it craves, so often it must eject one meal before it can take

another. Perhaps a fly that has been feasting in a filthy cuspidor wants a taste of your pudding. It will stand on the pudding for a second and spit up some of its last meal to make more room so that it may partake with you of the tempting pudding. What the fly spits up is too tiny for your eyes to see; and if you did not know about it you might eat, along with the rest of your meal, some of the germs which cause tuberculosis or some other dread disease. The house fly has no teeth; so when it wants to eat cake or other solid food, it must first pour out enough saliva to dissolve it, then lap it up. Should you like to have a visitor of this sort dining with you at any meal?

Do you see one reason why so many babies become ill with stomach trouble in summer?

The fly does not care to remain indoors. If allowed to do so, it prefers to play a sportive game with its fellows, back and forth from filth to foods, the whole day long. Milk is one food of which it is very fond. It smells it on the baby's bottle, and helps itself to a drink. In exchange, it may leave for the baby some germs that, if swallowed, may make him ill.

Sometimes the fly, in its greed, falls into the pitcher,

pan, or bottle of milk and is drowned. Then it is necessary that the milk be thrown away. People pay so much for milk that this seems a waste; but when the fly falls in, some of the bacteria from its body are washed off into the milk. There may be hundreds of bacteria on the fly, and many, no doubt, are dangerous disease germs. In milk, bacteria grow faster than almost anywhere else, and a few from the body of one fly may develop a million in the milk in a short time. So it is never quite safe to use milk, or any other liquid, in which a fly has drowned.

Bacteria do not increase so rapidly on solid foods; but do you not think it is wise to run no risks, and to keep all foods away from flies? They are always disgusting, because they carry filth and make filth; and, if they have access to germs that cause disease, they are most dangerous.

Flies spread disease.

The bacteria a fly carries are likely to be of the most deadly sort. He is such a lover of rotting filth that he is ever seeking it from garbage heaps, pigstys, barnyards, outhouse vaults, cesspools, and wherever else it can be found. In some of these places he will very likely come in contact with disease germs. Discharges from the bodies of sick people are usually full of disease germs. People who care for the sick and those who are themselves ill are often very careless about throwing these discharges upon the soil, and about spitting upon the sidewalks or ground, so a fly has easy access to many kinds of germs.

Then, if he happens to crawl upon food, or dishes, or vessels used for drinking, or anything which goes to the mouth, he may leave germs enough to start any one of a number of serious diseases.

A man who makes a study of bacteria (Dr. William H. Parks) found that just one fly that had been feeding upon stuff in which there were typhoid fever germs left a trail of 30,000 typhoid bacteria as it walked over a Petri plate. It would have been the same, of course, if it had walked upon food.

Another investigator who trapped flies along the river front of New York City, at points where filth and sewage empty into it, found the germs of typhoid and other diseases on the feet and wings of nearly all the flies he caught.

When a large army of men live together in camp, it often occurs that many of them become ill with typhoid. It used to be thought that typhoid bacteria were chiefly spread through the use of bad water or milk or other foods, but now it is well known that these germs are even more often scattered by flies. At one time, in our Spanish-American War, there were 107,973 soldiers quartered in the military camps. Of these, 20,738 got typhoid fever, with great loss of life. An investigation proved that the disease was not due to polluted water nor to bad food so much as to flies.

In the Japanese and Russian War, with over a million Japanese soldiers in camp, there were only

two hundred and ninety-nine deaths from typhoid in all that great army, because the Japanese fought against their insect enemies as actively as they did against their Russian foes and subdued them both. Is it not strange that Japan should have been so much wiser than we were in regard to fighting the fly?

There are nearly 500,000 cases of typhoid in the United States every year, and nearly 50,000 deaths. Much of this loss of life is due to flies. Because the fly is so busy spreading the typhoid bacteria, Dr. L. O. Howard, of the United States Department of Agriculture, said the insect ought to have a new name, so now it is quite commonly known as the "typhoid fly." Typhoid is only one of the diseases the fly is responsible for. The germs of *cholera infantum*, *dysentery*, *tuberculosis*, and many other diseases are carried by the fly, as you can appreciate.

Nearly 50,000 babies die every summer from bowel trouble, the germs of which are probably brought to them in some way by flies. Oftentimes when the baby lies asleep, flies crawl over his hands and face, leaving flyspecks and germs which later may get into his mouth. Flies swarm around his bottle and about his food and dishes, leaving behind the seeds of death. Again, flies go from the sick to the well, taking along disease germs. All boys and girls who have babies in their homes can do much to keep them well by watching to see that they are screened while taking their naps, if there are any flies around. Of course, flies

should never be allowed to get on the baby's food or his dishes.

Wherever flies exist, it should be a household law that all foods, cooked or uncooked, should be kept carefully covered. I am sure you will think it is neither safe nor pleasant to eat food over which flies have swarmed. This rule needs to be applied also to all foodstuffs offered for sale, especially to fruits, salad greens, and such articles as are eaten raw. If produce merchants, meat sellers, milk dealers, bakers, and others who handle food in your town do not do this, can you think of some good way to make them do it?

Precautions to be taken against flies.

Feeding on filth, the fly also eats many bacteria. Most of these pass through its body unharmed and are deposited in flyspecks. Dr. Koch, a German scientist, found the living bacteria of tuberculosis in flyspecks on a chandelier in a house where a man having that disease had lived.

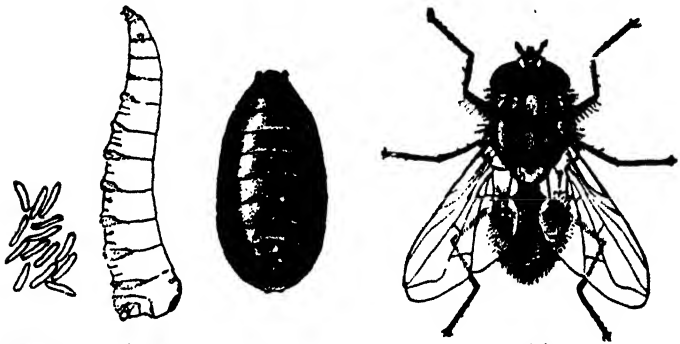
In the following three ways a fly may distribute bacteria:

1. By carrying them on its wings, mouth parts, legs, and feet.
2. By having them on its body when drowned or when crushed on anything likely to get to a person's mouth.
3. By flyspecks.

The fly hatches from an egg, which is most often laid in stable filth. When this filth is not at hand, the fly will lay her eggs in any wet, rotting stuff she

can find. She finds it by smell. She is especially keen in finding moist garbage, street sweepings, waste from the slaughterhouses, pig wallows, the waste from human bodies, dead animals, decaying vegetables, meat, cheese, fish, rotting straw,

Flies are bred in filth.



LIFE HISTORY OF THE HOUSE FLY.

leaves, grass heaps, and even old rags and papers on the dump pile.

The fly must have three things, — filth, warmth and moisture, — or else her eggs will not hatch. In winter and in very cool weather flies are not very common, because there is not warmth enough to hatch the eggs.

The fly usually lives for about three months. Most flies die at the approach of cold weather. A few young mother flies live in hiding during the winter season. When spring arrives, they come out and begin to feed and to lay eggs for the summer supply of flies.

A single fly lays from 120 to 150 eggs at one time.

In warm weather, it takes less than a day for these eggs to hatch into little white wormlike creatures, commonly called *maggots*. Their right name is *larvæ*. If you have ever seen any of them, you know they are very active, wriggling little creatures. They feed on the filth in which they are hatched, and they grow very fast until they are five days old. Then they change into another form, — a sort of *cocoon* called a *pupa*. This is covered with a hard brown shell, from which in a few more days a full-fledged fly will come forth. The growth from the egg to the full-grown insect takes only about ten days. After coming out of its shell, the fly sports about and feeds for fourteen days before it is mature enough to lay eggs. A fly may live to lay six separate batches of eggs.

Dr. Howard says that in a climate like that of Washington city, twelve generations of flies are born in a single summer. He has also made a very interesting calculation which shows that, since one fly lays so many batches of eggs, and so many eggs in each batch, if every egg hatched and all the flies developed, and each mother fly in turn laid eggs, and there was nothing to hinder a similar multiplication of flies through the twelve generations, — at the close of the summer the descendants from a single fly might number 1,096,181,249,310,720,000,000,000,000. Remember that one fly can carry 6,600,000 bacteria.

Do you not think these figures make plain the great need of working hard to do away with flies?

The very best way to get rid of flies is not to raise them. If one lives in the country, with no near neighbors, he can, if he chooses, easily keep free from flies. In cities, villages, and towns it is harder to do this, unless all the people are willing to help. It takes a lot of care to keep the houses, yards, barns, factories, and streets, and all the alleys, byways, and dump piles as clean as they need to be to prevent flies from developing. If there are any careless citizens, flies enough may breed on their premises to bring harm to everybody in the town.

How to get rid of flies.

The things to be done, to keep flies from being born, are: (1) to catch the winter flies as soon as they come out of hiding and before they have time to lay eggs; (2) to make things so clean everywhere that there will be no filth around in which a fly can lay its eggs. Flies cannot hatch in a dry place. Neither can they hatch in clean places. If we can keep everything about us clean and can persuade our neighbors to do the same, we can get rid of flies for good.

Wherever there are horses, it is most important that the stable filth be kept in a screened pit, or closet. If any flies develop there, they will seek light and will collect about the screens, and they can then be easily killed by burning paper or in some other way. One good way to do is to have the filth removed once every week and spread upon distant ground to be plowed under. A shovelful of chloride of lime scattered every day over stable filth will destroy any maggots that

may have hatched. A 5 per cent solution of *carbolic acid* sprinkled over the filth and all about the stable with a watering pot is another good way to keep the flies down. Its odor is so disagreeable to flies that they will not lay their eggs near it.

If garbage cans are kept closely covered, and no smears or droppings of food are left about them; if they are emptied every day and well scrubbed before being used again; if vaults are treated at all times to a plentiful use of dry earth, and at least once each week to a thorough sprinkling with crude *petroleum;* if there is no moist litter left about anywhere, — flies will find little to attract them.

MANURE SHOULD BE PUT IN A VAT LIKE THIS AND HAULED AWAY DAILY.

To make doubly sure, it is well to sprinkle *chloride of lime* or *petroleum* about the place where the garbage can is kept. Do the same with every moist corner or thing about the place.

The fly is not a very good traveler. Unless borne by the wind or carried on wagons or trains, it rarely goes far from its birthplace. So, if we find flies coming to our homes, we may presume there is some place quite near which furnishes them a good breeding place.

If we are wise, we will find this place, and clean it up as soon as possible.

But if flies do get indoors, it is best to destroy them in the house. To drive them outdoors may do no good; they will probably come back and bring their friends with them.

The fly is a thirsty creature and often seeks drink. If we put two teaspoonfuls of *formaldehyde* into one half cup each of milk and water, it will make a good fly destroyer. Place a little of it in saucers near windows and places where flies sport. It is best to put a small piece of bread in the center of the dish for the flies to light on. A still better plan is to fill a milk bottle, in the edge of which a small nick is made, with a 2 per cent solution of formaldehyde. Instead of putting a stopper over the bottle, hold a saucer close against its mouth and quickly invert it. Stand it thus on a shelf in a shady corner near bright sunshine, or on the window sill — any place that flies frequent. As only a small amount of the liquid can flow into the saucer at a time, it will last for a long period.

If flies are numerous in the neighborhood, the number likely to get indoors may be lessened by keeping doors, windows, and fireplaces carefully screened. This, of course, will keep out some fresh air. One observing lad recently asked, "Why not put the *flies* in jail, and let ourselves out?" This question was such an apt one that it led to the making of a kind of outdoor flytrap to be attached to garbage

cans and to be applied to other feeding and breeding places, to catch flies before they get into the house. This is certainly a good, safe, and cleanly way, if there are flies to catch. This is how it is done. The fly is permitted to follow its bent and seek inside the trap the food which it smells. When it has eaten enough and flies toward the light, as flies always do, it finds itself in a trap. If one were to attach such a trap to the screen on the inside of a stable pit, it would catch all flies as they hatch. Another fitted to the outside would trap flies that are seeking to get in to lay eggs.

THE FLY IS ONE OF OUR MOST DEADLY ENEMIES TO-DAY.

One splendid thing about such outdoor traps is that they can be started early in the spring, and they will catch the winter flies when they come out of hiding on the first warm days. Then, too, young flies will get trapped before they are old enough to lay eggs.

To catch winter flies, to deprive flies of breeding places, to kill the larvæ, to catch young flies before

their eggs are laid, are some of the ways in which we can fight flies.

Boys and girls can aid in the war against the fly. Every one should lend a hand. Not long ago, some five thousand boys and girls in Washington city took part in a two weeks' fly-catching campaign, with the result that over seven million flies were destroyed. We cannot tell how many lives were saved thereby, but we can be sure that it was a good many.

REMEMBER: One fly with its load of bacteria can start disease in scores of homes. During the Spanish-American War, only 250 of our soldiers were killed by bullets, but 5000 were killed by disease carried by flies; and so, in every way possible, we must keep flies from breeding and from getting into our homes, if they manage to get born somehow.

HEALTH PROBLEMS

1. Why can a fly walk on the ceiling as well as on the floor? Make a little drawing of its feet, to show how they are constructed so that they can cling to any object in any position.

2. If you live in a town or city, try to find out what spots the flies like to visit best, and see if you can get at the reason for this.

3. It is said that a fly can carry 6,600,000 bacteria. If you should place all these together, how much would they weigh, do you suppose? How big a heap would they make, do you think?

4. What kinds of food seem most attractive to flies?

5. If you let them walk over a table freely without frightening them, what dishes will they hunt out especially?

6. How can one tell that flies are guided by the sense of smell to their food, instead of by the sense of sight?

7. If flies are drawn to places because of their smells, how could you fix it so that they would not be drawn to those places?

8. Are there any places or things about your school buildings which are especially attractive to flies?

9. Look carefully about your house, and outbuildings, if you have any, and try to find out what there is that might make good food for flies. Are there any good breeding places for flies around your house?

10. How can people find out that flies carry bacteria on their feet, on their wings, on their mouth parts, and so on?

11. Ask the health officer in your city whether there has ever been an epidemic of any kind caused by the flies. If there has been, find out all you can about it and tell the class. How could it have been avoided?

12. Visit a fruit stall in your town or city, and observe whether the fruits are covered with flies. Does the merchant take any pains to protect his fruit from flies?

13. Visit a meat shop, and see whether the meat is carefully protected from the flies. In the same way, visit a bakery, and see what care is taken to protect the food from flies.

14. Have you ever noticed flies in candy stores or around soda fountains? How should you like to drink soda water which had first been tasted by flies?

15. Have you noticed that any house flies live all winter in your house? Where do they hide? Is there any way to exterminate them?

16. Are there any stables near where you live? If so, observe whether the flies are thicker there than they are in any other place. Explain.

17. If you can, get a little sample of *chloride of lime* at your house, and show it to the class. Also get a little *carbolic acid*, but you will have to be very careful about this, for it is a poison.

Why do you think chloride of lime and carbolic acid should drive flies from a place ?

18. Try to get a little bit of *formaldehyde*, and bring it to class. See if the class can tell why this should be a good fly destroyer.

19. Are the windows of your schoolroom screened ? Are they screened in your home ? If not, what do you think should be done about it ?

REVIEW QUESTIONS

1. Describe the main parts of the house fly. Tell especially about its feet.

2. Why does the fly gather so much matter when it walks through any sticky stuff ?

3. How many germs can a fly carry ?

4. What happens when a fly is covered with filth, and it walks over food or drops into milk ?

5. What sort of foods is the fly fond of ?

6. How is it guided to find its food ?

7. Why are the germs which it carries likely to be so harmful ?

8. What sort of appetite has the fly ? How does this make it all the more dangerous ?

9. How does the fly get its food ?

10. Why are flies likely to be so dangerous to babies ?

11. What should be done with a pitcher or pan of milk into which a fly has fallen ? Why ?

12. What did Doctor Parks find about the number of typhoid bacteria left by one fly ?

13. What was shown by the fly that walked over a number of culture plates ?

14. How many deaths each year in the United States are probably caused by flies ?

15. What name has Doctor Howard of the United States Department of Agriculture given to the fly ?

16. If a baby is trying to sleep where there are flies, what usually happens ? How can you prevent this ?

17. What should be a household law wherever there are flies?

18. Why are flyspecks likely to be the cause of disease?

19. In what three ways may flies distribute bacteria?

20. What is the form of the young fly?

21. What name is given to the young?

22. How can you destroy the maggots which may become flies?

23. How long does it take the fly to become full grown? How long does it live?

24. What is the best way to get rid of flies?

25. Can one person do much toward getting rid of flies unless his neighbors help him?

26. What breeding places do flies choose above all others?

27. What can you use to destroy flies, or keep them away from places?

28. Tell how people should keep their premises in order to discourage flies from visiting them.

29. Why is it necessary to keep one's windows and doors carefully screened?

30. Should all people join together "to swat" the fly?

CHAPTER XI

A Disease Carrier — the Mosquito

In the preceding chapter, we saw how much disease and misery are spread among all sorts of people by the little house fly. But another member of the insect family, very common in all climates, and known as the *mosquito*, has a bad record, almost if not quite equal to that of the house fly, as a carrier of disease germs. It does not carry the kinds of microbes that a fly does, but it spreads disease just as readily in another way. While there are some mosquitoes that distribute no microbes, still many of them carry the germs of *malaria*, and still others those of *yellow fever*. It is quite probable that other diseases common in warm countries are also due to mosquitoes.

The mosquito spreads disease.

One must swallow some of the bacteria the fly carries in order that they may have a chance to work havoc in the body. But microbes carried by the mosquito must get into the blood directly in order to do any harm. The mosquito has a long, slender, sucking mouth. To the naked eye, it looks quite like a humming bird's beak. But when we come to ex-

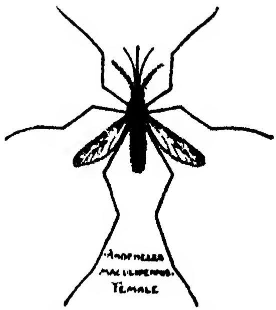
amine it, we find it is really a sheath that covers six separate mouth parts, — lances to pierce with, tubes, saws, and such devices.

The female mosquito has the stronger mouth parts, and it is she that does most of the harm to human beings. When the mosquito bites, she puts all six mouths to the skin at one time. The sheath which is used as a guide goes only to the edge of the skin. Then she punctures the skin, and draws up blood through one tube, and at the same time pours out saliva through another tube. Now, it is in her saliva that the mosquito carries the germs that cause malaria. When she bores the skin for a drink of warm blood, some of her saliva gets into the wound she makes; and then, if the saliva has in it the right sort of microbes, they enter the blood of the person bitten and grow and multiply until within a few days he may become ill with malaria.

Fortunately for many of us, the mosquitoes that peddle malaria germs do not always have the right sort on hand. The microbe that occasions malaria is one of the very tiniest forms of animal life. It is generally spoken of as a *parasite*. In the process of growing, it passes through a great many changes. It starts out in the blood of a person sick with malaria, but to complete its full round of life it must also spend a time in the stomach of a certain kind of mosquito, with the queer name Anopheles (A-nŏf′-ĕ-lēs). This is the only kind of mosquito that will answer the pur-

pose. The microbe would be digested if it got into the stomach of any other kind of mosquito.

If the Anopheles has not first bitten some one who has malaria, she will have no parasites in her saliva, and so she will be harmless. It takes several days (from seven to fourteen) for the microbes to develop in her body. But after the parasites have dwelt for a certain time in the mosquito's stomach, the next time the insect draws human blood, it may convey to even the most healthy individual the microbes of malaria.



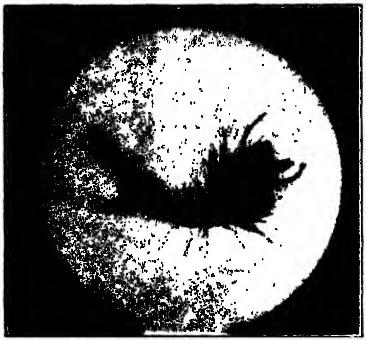
A DISEASE CARRIER.

The variety of mosquito which we see most frequently in northern climates is the *Culex*. This one carries no malaria parasites. Although it may annoy us greatly, its bite is not very harmful.

How mosquitoes are bred.

The life period of a mosquito is usually from four to six weeks. A few may survive the cold of winter until spring Then, having laid their eggs, they die. As with the house fly, the eggs hatch *larvæ*, which change into *pupæ*, and the pupæ develop into mosquitoes. The mosquito's eggs are always laid in still or stagnant water. It may be a large or a small body of water. A very little water will do; but there must be enough of it to cover the larvæ when the eggs hatch or else they will die.

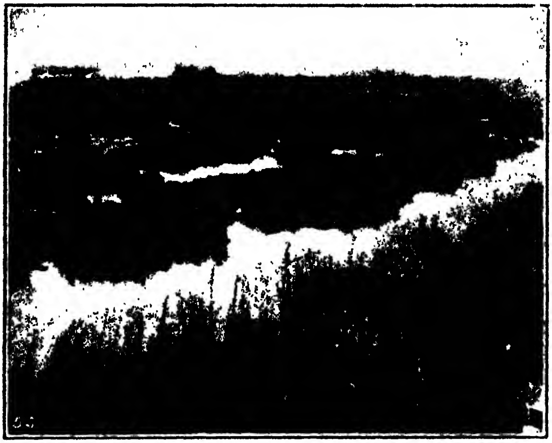
It makes little difference to the mosquito where she finds the water, — whether in the rain barrel, in an old tin can, in a watering trough, in a drain, in a stagnant pond, or in any standing puddle. Marshes and swamps have so many depressions which hold water that she seldom fails to find good places there in which to lay eggs. She likes, too, the edges of slow streams with grassy margins through which fish cannot penetrate. Water held in sagging places in the eave troughs, old pails at the back door, even cow tracks in the moist pasture, suit her very well.



THE LARVA STAGE OF THE MOSQUITO.

The eggs are laid upon the surface of the water. Some are laid singly, and others are laid in a mass. The Culex arranges her eggs in a raftlike mass which, being pointed at both ends, looks quite like a little gray boat afloat on the water. This boat of eggs may contain from 150 to 400 eggs, stuck together and standing on end, side by side. It only takes twelve hours for these eggs to hatch. The young larva cuts a hole in the lower end of its egg and drops into the water beneath. Then it begins to wriggle through the water, and goes so fast you can hardly see it unless the water happens to be quiet. For this reason the larva is called a "wriggler."

Now, if you should have a chance to dip up a glass full of water in which there are wrigglers, you would notice that they keep coming to the surface, and poking the end of their bodies through the water. This is the way they get air to breathe. They feed on what they find in the water, but they must come to the top



A GOOD BREEDING GROUND FOR MOSQUITOES.

for air. The wriggler grows very fast; and in a week in warm weather it changes to a curious club-shaped pupa. It looks quite like a little tadpole. It never eats as a pupa; and, unless disturbed, it will remain quietly floating on the surface of the water for two or three days. Then its skin cracks open down the middle of the back, and a full-grown mosquito crawls out. Thus you see it takes about ten days, in warm

weather, for an egg to become a full-grown insect. It takes longer in cold weather.

The Anopheles and the Culex mosquitoes.

The Anopheles mosquito lays her eggs singly but in groups. Both wriggler and pupa, unless disturbed, remain at the surface of the water, holding their bodies straight with it. It takes this kind of mosquito nearly a month to develop from egg to insect. The Anopheles chooses a different sort of place from the Culex in which to lay its eggs. It breeds more commonly in shallow pools, ponds, canals, and bodies of water that are large enough to be permanent. On this account, it is called a "country" mosquito; and the Culex, which will breed in anything that holds a little water, is termed the "city" mosquito.

Mosquitoes never fly far. Sometimes they are borne some distance by the wind; but the Anopheles has a habit of clinging to the grass and weeds when the wind blows. As they fly about, the Culex and Anopheles appear quite alike; but if you should chance to see them when they are resting, you could tell them apart, for the Anopheles always stands out at an angle from the surface it is resting upon, as you see in the picture. Every other kind of mosquito lies with its body in a straight line with the thing on which it rests.

There are other ways by which you can tell them apart. Culex has wings of a yellowish brown color all over, and Anopheles has darker bands, or spots, on

its wings. The Anopheles, too, sings its song in a much lower key than the Culex. Their manner of attack is also different. The Culex moves slowly, buzzing about for a time before biting; but Anopheles goes at her work with a rush, and often bites a person before he realizes that a mosquito is about. The Anopheles is frequently seen in houses, clinging to walls and ceilings in the daytime. It seems inclined to sleep during the day and to work at night. The Culex does not care much to remain indoors.

THE ANOPHELES ALWAYS STANDS OUT AT AN ANGLE FROM THE SURFACE IT IS RESTING UPON.

How we know that mosquitoes spread malaria.

It is only within a few years that much has been known about the part the mosquito takes in spreading malaria. It used to be thought that living upon marshy lowlands and going out in the dampness and fogs in the early morning gave people malaria. Then some one happened to think that mosquitoes are thick in swamps and marshes, and he began to suspect that

they might have something to do with the disease. Scientists set about to make a study of the subject, and they found out much that led them to believe that the mosquito is the cause of malaria. They put the matter to a hard test to make quite sure. This test took place in 1900. It is easy to remember the time, for it was during the first year of this century. The place chosen was a great, marshy plain, lying close to the city of Rome, Italy. It was said that no person ever spent a night in this marsh without getting malaria. Sometimes poor Italians who wanted homes made huts for themselves on the tops of ancient tombs, many of which lie along a broad road which passes through this marshy country, or *Campagna*, as it is called. Perched on the top of these old ruins, twenty or thirty feet above the ground, these poor people lived quite free from malaria. Can you think why? It was not very convenient to live so high up, because they had to climb ladders to get indoors; but it was safest. People who slept near the ground were sure to get malaria.

The malaria test.

To make the test, two Englishmen from London (Drs. Sanborn and Low) and an Italian gentleman undertook with their servants to live from June till October, the season when malaria is most common, in the very worst part of the Campagna. They built a five-room cottage on the banks of a canal that swarmed with Anopheles mosquitoes. But they made this cottage mosquito

proof, by putting screens on all the doors and windows. They took care to be inside the cottage by sundown. It seems that these mosquitoes, like wild beasts, prowl about mostly during the night time for their prey. When October came, not one of these persons had shown the least sign of malaria. Another Englishman (Dr. Elliott) went out to Africa some time before this to study the cause of malaria in the swampy regions of that country. He and his helpers spent several months living in the marshes. They took care to protect themselves by mosquito nets at night. Not one suffered from the disease.

To make the proof still more certain, an English physician made a test upon his son. He allowed him to be bitten by an Anopheles that had been fed malaria parasites. There was no other way in which the boy had been exposed to malaria; but in two weeks' time he became sick with it. The Japanese government also wanted a positive proof, so it sent a number of soldiers into a district where there was much malaria. The soldiers were divided into two squads. One of these lived in screened tents, with mosquito netting around their bunks, and they were not allowed to go out after sundown. The second squad was unprotected. Many of these latter soldiers got sick with malaria, but not one of the others had the disease. So now we know that malaria does not come from swamps and ditches, but from the mosquitoes that feed in these places.

There are a good many kinds of mosquitoes besides the Culex and the Anopheles. Another sort, that goes by the odd name of *Stegomyia*, carries the parasite of yellow fever, a disease more to be dreaded than malaria. Yellow fever is common in tropical countries. In some places in Mexico, Central and South America, and the West Indies, it used to cause great loss of life. At certain times, during the warm season, it has been widespread in some of the southern parts of our country. In just one summer, nearly 16,000 persons died of it in the states of Louisiana, Mississippi, and Alabama. People greatly feared the disease, as well they might. It was supposed to be *catching*, that is, that one might get it from a sick person, or by handling his clothing or bedding. The weather, too, was thought to have something to do with it. Whenever yellow fever broke out, everybody who could go fled to some cooler place to get away from it. Those who were unable to leave home longed and prayed for frosts; for it had been observed that when the weather became cold enough for frosts the disease died out. In places where there were never any frosts, cases of yellow fever were likely to occur at any time of the year.

The Stegomyia spreads yellow fever.

Some years ago men of science began to study the cause of this disease; they believed if the cause could be discovered, a way could be found to prevent it. Finally, at the time of the Spanish War in Cuba, some

experts belonging to the United States army, with Dr. Walter Reed at their head, were appointed to investigate the matter. The place chosen for the study was one where there were already many people ill with the fever, and since no one knew just what to do there seemed no way to prevent its spread. You can imagine, can you not, that it took great courage on the part of these men to undertake to battle with such a deadly foe. But they belonged to the army of true soldiers who are ready to sacrifice themselves and work for the good of others. They had to risk their own lives in this effort to learn how to save other lives.

It had already been suspected that the disease was carried from the sick to the well by mosquitoes. There was no way to make sure of this but to note the effects of the bite of insects known to have sucked the blood of yellow fever victims. Some one then must stand the test. Now these brave men, who knew so well the peril of life which this meant, would not ask of others what they were not willing themselves to do, and so they quietly resolved to be the ones to stand the test. Before they were quite ready to begin, Dr. Reed was called to Washington for a time. The first one bitten was Dr. Carroll. Within a few days he became severely ill with the fever but afterward recovered. Dr. Lazear, at his duties in the yellow fever hospitals, saw a mosquito settle on his hand. He allowed it to remain there, drinking its fill from his body. In less than a week he came down with the fever in its

very worst form, from which he died, a brave martyr to the cause of humanity. So long as he was able to think he was writing out the record of his experiments to help along the work for which he laid down his life.

It was now plain that the Stegomyia mosquito was a carrier of yellow fever; however, as yet it was not certain that the mosquito was the only cause of the disease. Upon Dr. Reed's return he set about to find this out.

In a camp where the sick soldiers were cared for, about a mile from the city of Quemados, a small house was built. Every door and window was screened so that not a single mosquito could make its entrance from the outside. Here a test was made to see if yellow fever could be brought on by contact with anything worn or used by the sick. Here seven men spent twenty nights sleeping under bedclothing brought from sick rooms, and even wearing clothing which yellow fever patients had worn and soiled, without their having been washed, things so foul smelling as to be almost beyond endurance; neither were any pains taken to keep the house clean and sanitary. Notwithstanding all this not a single man got yellow fever, a fact that made plain that the fever was not catching, nor the result of filth.

It was not yet plain just how long a time must pass after a mosquito drinks yellow fever blood before it can give the disease to its victims. To learn this

required further tests. A call was made for volunteers, and a money reward offered for their services.

The first to respond to this call were two young soldiers from Ohio (John R. Kissinger and John J. Moran). To make sure they understood what was required, the great risk of such an experiment was fully explained to them. They were likewise told of the $200 reward each could claim. When they had heard all that was said, each declared himself ready to undertake the test, but that *on no account would he accept pay for so doing.*

JOHN R. KISSINGER, U.S.A., THE FIRST TO VOLUNTEER HIS SERVICES IN THE YELLOW FEVER TEST.

In a room where were kept several Stegomyia mosquitoes known to have yellow fever poison, these young heroes, each by himself, faced the test. On three different occasions each spent a time in this room allowing mosquitoes to bite him. As was expected, both became very ill with the fever, but both recovered.

In all twenty-two persons risked their lives with heroic courage to find the cause of the fearsome fever, with the result that proof beyond any question pointed solely to the Stegomyia mosquito.

Then it was plain to every one that in order to put a stop to yellow fever the mosquito must be got rid of; and the people of Cuba set about this with a will. The first thing they did was to hunt for every spot where mosquitoes might lay eggs and to destroy such breeding places. One method of doing this was to coat the surface of all standing water with oil. Neither larvæ nor pupæ can get through the oil film on the water to get air. If they cannot come to the surface, they soon drown. The grown mosquito will not lay eggs on oil; and so where all standing water is kept covered with oil, mosquitoes soon die out. Another thing they did was to screen the sick from mosquitoes. The stegomyia can only get yellow fever parasites to convey to other people by sucking the blood of a person ill with the disease or of one who has died from it. So if they can never get to a sick person, they will have no yellow fever germs, and their bite will be harmless.

How to get rid of the mosquito.

Within ninety days after Dr. Reed's work was finished, yellow fever for the first time during the mosquito season was entirely wiped out of the city of Havana. Since that time there has been no spread of that disease in the island of Cuba.

Although such a tiny insect, the mosquito was one of the greatest obstacles in the way of building the great Panama Canal. Both the Stegomyia and the Anopheles abound in the Canal Zone. At times there were so many cases of malaria and yellow fever it

was quite impossible to keep a sufficient force of men to carry on the work. When, in 1904, the Americans took possession of the Isthmus, they put into practice the measures which had already proved successful in Cuba, with the result that within a year yellow fever was banished from the Isthmus.

In 1906 yellow fever got a start in New Orleans. The people there were slow to put into use the new-found knowledge, and so before they were hardly aware of it, the disease had spread to every part of the city. Then the people were aroused, and they screened the seventy thousand cisterns in the city, and poured coal oil over every standing pool of water. Houses, too, were fumigated in order to kill any stray mosquitoes that might have gotten in. Then, just when it seemed they were winning out against the mosquito, there came a dreadful rain storm. It flooded the city and washed away the coal oil. Not only did it undo their work, but it provided a splendid new chance for the mosquito. The citizens felt discouraged. But the next morning, when they came upon the streets, they saw all about them placards on which were the words:

> "Wear a smile upon your face,
> And a flower in your buttonhole."

Tens of thousands of these placards were to be seen about the city. Like the call of a trumpet, they stirred the disheartened people to fresh action, and

the work went on until the "yellow Jack" was driven out for good.

The Stegomyia mosquito may be detected by the white bands on her legs and white marks on the upper part of her body. If there is no yellow fever about, she can do no more harm than any other mosquito. Of course, no one can tell beforehand whether or not a mosquito has a load of parasites. So it is best to take no risks with them. The safe course is to get rid of all of them.

It is difficult to destroy full-grown mosquitoes. But a smudge or dense smoke will have a good effect in driving them away from any place. If they have got into a house, the following plan may be tried: Buy some *pyrethrum* powder at the drug store. Heap it up into a little pyramid and light it at the top. As it burns, its odor will stupefy the insects, and they will drop to the floor. It does not kill them, so they must be swept up and burned. A pound of this powder to one thousand cubic feet of space will answer very well. If the mosquito one is trying to destroy is the *Stegomyia* and dangerous, there would be greater safety in burning sulphur (two pounds to a thousand cubic feet of space) as directed in the chapter on disinfection. Strong sulphur fumes will soon kill a mosquito, as it will also kill any other living thing in time.

The proper thing to do is to deprive the mosquitoes of a place on which to lay their eggs. Some of the ways in which we can do this is to:

1. Clean out all places where water stands.

2. Turn over every pail or tub that may hold water.

3. Pick up old tin cans and bottles and put them where rain cannot fill them.

4. Screen rain barrels and cisterns so the mosquitoes cannot get to the water to lay eggs.

5. Keep the roof gutters clean, and be sure that they dry out after rains.

6. Screen the wash water, if it is left standing over night.

7. If there is a drinking pan for birds or animals, change the water in it every day.

8. Fill all holes and hollows where the water stands on the ground. A large place like a swamp must be drained and filled up.

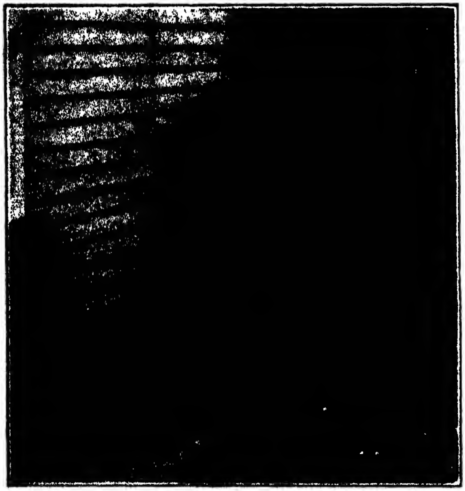
9. Coat ponds, pools, drains, cesspools, and any standing water with a film of coal oil.

Fish eat mosquito larvæ. A few goldfish, minnows, or tadpoles in a pool will soon rid it of larvæ. Swallows and martins destroy mosquitoes. Would it not be wise to encourage these little birds to live near our homes and help us to destroy these insect pests?

Whenever mosquitoes are plentiful, doors and windows need to be well screened in order to make a house safe. It is a good plan to keep the screens lightly painted with kerosene. Why? Another means of protection is a canopy of mosquito netting to cover the bed in which one sleeps. This needs to be of ample size, so that it can be folded under the mattress at every side. A good way to do is to suspend it from a pulley in the ceiling above the bed.

Other insects that spread disease.

Finally, another very tiny insect, a certain kind of flea, spreads the *bubonic plague*, a disease so fatal that in India, where it is most common, nearly a hundred thousand lives have been lost in one month. It is supposed that in the beginning the plague was a disease of rats. Fleas live between the hairs of the rat. They get the germs, and then it is easy for them to take these germs from rats to human beings, and from one individual to another.



STAGNANT WATER IN TUBS AND BARRELS MAKES A FINE BREEDING PLACE FOR MOSQUITOES.

Rats sometimes board ships and go from one country to another, taking the fleas and germs along with them. This happened in 1907 in San Francisco. The men who look after health in that city knew about the rats and fleas, so when they learned that there were people in that city sick with the bubonic plague, they started a warfare against rats, killing more than a million in that city. As soon as they were killed, the bodies of

the rats were dipped into some liquid to destroy both the germs and the fleas. This work was so thoroughly done that only 140 people in that large city got the disease.

It has been found that to a wood tick, common in the Northwest, is due the dreaded Rocky Mountain spotted fever. There is a suspicion, too, that the cat and dog flea, the cockroach, the bedbug, mite, and other pests may help in scattering disease germs. Anyway, do you not think it is best not to harbor any of them?

REMEMBER: The pain which the bite of the mosquito gives us is likely not to be the worst part of it. The mosquito is a carrier of dreaded diseases, and it should be prevented from breeding anywhere on one's premises, and it should also be destroyed if it manages to get into the house in any way. Carelessness in regard to this matter may cost one a great deal in time, money, and good feeling.

Health Problems

1. Which is the more common in the community in which you live, the house fly or the mosquito? How do you explain this?

2. Does your skin swell up and itch when you are bitten by a mosquito? Explain.

3. What is the meaning of a *parasite?* Mention several kinds of parasites.

4. What is the difference between *bacteria* and *microbes?*

5. If you can possibly do so, find a larva of a house fly or a mosquito, and note the changes it passes through as it develops.

6. Where are the mosquitoes thickest in the community in which you live? Explain.

7. Is there any place in your neighborhood in which there are few if any mosquitoes? Explain.

8. Do you know in what section of our country mosquitoes are most common? Explain.

9. Make a list of the places or things around your home which make good breeding places for mosquitoes. Why?

10. Find some of the eggs of a Culex and also a "wriggler" or two, and show them to the class. Where will you look for these?

11. Are there both Culex and Anopheles mosquitoes where you live? Can you tell them apart? How?

12. How do the people in your neighborhood protect themselves from mosquito bites? Is it an effective method?

Review Questions

1. What insect is the cause of almost as much harm as the house fly?

2. Does it carry the same kinds of microbes as the fly does?

3. How does the mosquito convey its microbes to people?

4. What are the chief diseases which the mosquito carries?

5. Describe the mouth of the mosquito, mentioning the parts and their uses.

6. Describe the way in which a mosquito draws blood from a person.

7. How do the microbes escape from the mosquito into the blood of a person?

8. What is the *Anopheles* mosquito?

9. How does the Anopheles get the parasite of malaria which it puts into the blood of the person whom it bites?

10. What is the life period of a mosquito?

11. When does it lay its eggs?

12. What changes are passed through by the larva of the mosquito before it becomes full grown?

13. In what kind of water does the mosquito lay its eggs?

14. What places about the house or the barn or the yard are likely to become breeding places for a mosquito?

15. What is the difference between a Culex and an Anopheles?

16. In what form does the Culex arrange her eggs?

17. How long does it take the eggs to hatch?

18. How do the "wrigglers" get the air which they need in order to live?

19. Does the Anopheles lay its eggs in the same sort of places as the Culex?

20. How can one distinguish the Culex from the Anopheles?

21. After it has bitten you, can you tell without seeing them which one of these mosquitoes has paid you a visit?

22. Why did people once think that malaria came from marshy lowlands and swampy places?

23. How has it been proved that the mosquito causes malaria?

24. What other deadly disease is spread by the mosquito?

25. Why did people think yellow fever was catching?

26. What study was made by the United States government which showed that the mosquito was the means of spreading yellow fever?

27. Describe another test which was made to prove the same thing. What was the result of these tests?

28. How did Cuba get rid of the mosquito which was the cause of yellow fever?

29. How can one tell the *Stegomyia* mosquito?

30. What is a good way to destroy mosquitoes if they get into one's house?

31. What sort of diseases are likely to be spread by fleas? What animals harbor them?

32. What is supposed to be the cause of Rocky Mountain spotted fever?

CHAPTER XII

Getting Pure Water and Keeping it Pure

As you look at water in a glass, you see only a clear and colorless fluid. But look at a drop of the same water through a microscope; you may find there a great number of tiny forms of life just as perfectly and wonderfully made as some living things you can see with the eye alone. Perhaps you appreciate that there is an unseen world all about us, in which a great deal is going on of which most of us know very little.

The bacteria found in water.

We have learned of the bacteria which float around in the air on dust particles. We must now see that there are certain kinds of bacteria which are found only in water. There are more than a hundred different varieties of them. They are found in water everywhere, in a greater or less number, except in clean, fresh rain water, and water brought up from deep wells. Water that has been in contact with the soil or with dust is sure to contain germs. Of course, they may be killed by boiling and in other ways of which we shall learn later.

All the water on the earth comes in the first place from the clouds. You know the story of the "water

circle," — how water evaporates from the surface of oceans, seas, lakes, and rivers; how it forms clouds, turns to rain, and falls to the earth, only to evaporate again, and go through the same changes as before. If it fell on a clean earth, all would be well. But you see,

ALL WATER COMES IN THE FIRST PLACE FROM THE CLOUDS.

when the rain comes down, there is dust on so many things it touches that it is no wonder it gathers up a lot of bacteria. Even the air through which it falls is likely to be dirty and full of bacteria in some places.

Water usually collects the kind of bacteria which are the cause of disease from the filth on the ground through which it soaks. Bodies of water into which

drains or sewers empty their contents are sure to contain bad germs. Of course, if any such foul water finds its way into our drinking supply, we shall be likely to swallow some of them. Then what may happen? The worst of these harmful water bacteria cause typhoid, cholera, and various painful and serious diseases.

CAN ANY ONE GET HARMFUL GERMS OUT OF DRINKING WATER BY STRAINING IT?

A lady I know who had heard some one speak of these dangerous bacteria always strained her drinking water through a very fine sieve "to take the germs out." If you had seen her do this, and she had asked you for advice, what should you have said to her? Should you have told her that after straining her water she could drink it without getting any bacteria? It takes 25,000 of these small creatures placed in a row to make one inch; 250 of

them together could go through the finest hole in the strainer.

It is their very smallness that makes them dangerous. We cannot see them, so we may drink them in our water without having the slightest idea of what we are doing. It is not necessary to drink spoiled water in order to take some of these deadly bacteria into one's body. If a dish should be washed in the water and then food served in the dish, some of the bacteria might get from the water to the dish, and from the dish to the food, and so be carried into the body.

Bacteria in water spread disease.

In a California town, some years ago, there was a serious outbreak of typhoid fever. The men who look after the health of the people there set about to trace the source of the mischief-making bacteria. They followed up every clew they could get, like detectives hunting for a burglar. It happened that the first cases were all people who bought milk of the same dealer, and it was decided that the milk must have contained the bacteria. How any typhoid germs could get into the milk was a mystery. Finally it was found that the milkman was washing his cans in the water of a stream that had got germs from a typhoid case three miles above the dairy.

There is only one way that typhoid germs can get into water, and that is from the bodies of those who have the disease. If the refuse from the sick room is thrown out upon the ground or into earth closets, the

rain may wash the germs into streams or wells. If this refuse is emptied into the house drainage pipes, and carried through sewers which empty into running streams, a whole town's water supply may be endangered. Show how this may be possible. There is just one safe way to do with all wastes from persons sick with typhoid fever, — *destroy them at once.* If this were done in every case, the spread of typhoid fever through water would soon be checked.

One spring, not very long ago, the town of Plymouth, Pennsylvania, had 1104 cases of typhoid fever, with 114 deaths. As many as two hundred people were taken ill with the disease in a single day. It was noticed that people who used water from wells escaped the sickness. So it seemed plain that the bacteria which were doing the harm must be in the public water supply. The people began to investigate, and they found that a man who lived on the banks of a stream that flowed into the town had typhoid fever during the previous winter. The wastes from his body were thrown out upon the snow. In the spring, when the snow melted, typhoid bacteria were washed into the stream, and thence into the public water supply. Think of it! More than a thousand people made ill, more than a hundred lives lost through the carelessness of one family. You see, even freezing did not prevent these germs from doing harm.

Things that once had life, but have died, as leaves, grass, twigs, insects, birds, and other creatures, and

that fall into water and decay, help to make it unfit for drinking. Why?

Nature's method of making rain suggests the way by which the water may be purified. The vapor the sun draws up from the stagnant pond covered with slime is as pure and fresh as the vapor drawn from any water. From the dirtiest pool in the city street having germs enough to make many people sick only pure water evaporates, leaving the dirt and germs behind. Why do the germs not go up with the vapor? When the vapor is turned into water again, it is quite pure and safe to drink, provided it falls through clean air and is caught and stored in clean cisterns. A great many people have no other water supply but the rain which they catch.

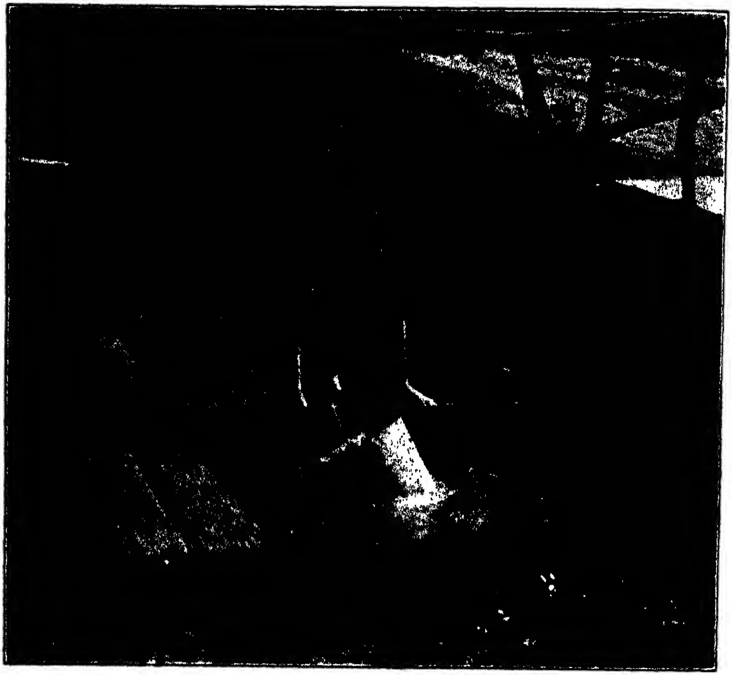
How water may be purified.

When rain water is used for drinking, it is necessary to let the first washings of the air and the trees and dirty roofs run off Why? It is necessary also to store rain water for drinking in a well-made tank *above* the ground. When *underground* cisterns are used, it may happen that germs may find their way into the water from drains, pipes, or cesspools near by. The best kind of tank to use is one made of cement so constructed that it can be easily cleaned. Do you think such a tank would need to be covered? Why? Have you ever seen one left open?

In Bermuda, where people have nothing but rain water to use for drinking and cooking, they have a law that every building on the island must be white-

washed every year. Why do you think this law was made? Is it a wise law?

How does the water that comes to us sparkling and cool from deep underground get so deep in the earth?



ONE IS LIKELY TO GET PURE WATER FROM ARTESIAN WELLS.

As rain falls on the ground, some of it flows along the surface, and some of it soaks through the ground until it comes to rock or hard clay that it cannot enter. Then it collects in underground basins or finds its

way by hidden paths to the ocean. People generally suppose that water from a spring is always pure water. It may be pure, if the spring is on the top of some high hill or mountain. What difference do you think its location will make in the quality of the water? A stream that flows from a mountain spring may be pure water too, if it flows through a gravelly bed, and through land where no one lives. But streams running through a town are likely to receive sewage and other foul drainage that make the water unfit to drink.

Doubtless you have seen water from an underground spring pouring steadily from the mouth of a pipe that had been driven deep down into the earth. As a rule, the water from such a well, an *artesian* well, as it is called, is safe water, because very few germs are found down in the earth at a distance of more than three or four feet. The dangerous waters which have to be looked after carefully are the *surface waters*, such as those found in brooks, springs, creeks, rivers, and lakes. These get the washings from the surface soil and from any filth the rain falls upon.

The contamination of water.

Many people make wells as storage for water for common use. Oftentimes these are just holes dug in the ground, only deep enough to reach water. To prevent the dirt from caving in, the hole is walled about, often with nothing but rough stone. Between these loose stones, water from the surface of the ground may readily filter into the well. Is such a well as this dangerous? Why?

Wells have a very ancient history. Until 1854 a well was usually looked upon as a safe source for a water supply. In that year there was an outbreak of Asiatic cholera in London, and more than ten thousand people died. It was noticed that a certain much-used well in Broad Street seemed to be at the center of the trouble. The people were warned not to use the water from this well, and an examination was made. It was found that the bricks lining the well had become loose, and a vault from a near-by house was leaking into it. No doubt a cholera patient had been in that house, and the germs of his disease had got into the vault and passed from there into the well. Even when people were dying of cholera all around that Broad Street well, there were people who were foolish enough to come and drink the water, until some one had the good sense to take off the handle of the pump so that it could not be used. Since this discovery, dug or surface wells everywhere are looked upon with suspicion — especially those near any breeding place for germs.

Not long ago a physician told a mother whose two children had died of fever that he believed her cesspool was leaking into the well. The mother thought this was not possible, but the doctor determined to test the matter. He told her to pour five gallons of kerosene oil into her kitchen sink, which drained into the cesspool, promising her that if the well water did not taste of it in less than thirty-six hours, he would

pay her for the oil. (A good test, I may say in passing, would have been to put into the sink a quantity of some aniline color — find out what this is — and see if the color would appear in the water.)

The mother did as the doctor advised; and in about twenty-four hours the well water had so much oil in it that it was impossible to use it. It now seemed plain what had killed those two children, — germs that got into the well from the cesspool. You would think the mother would have been thankful to the doctor for showing her how to protect the rest of her family from fever and perhaps save their lives. On the contrary, she was very angry with him for "spoiling her well."

WOULD YOU CARE TO DRINK FROM THIS PUMP?

In the country, wells are often so situated that they receive the drainage from the house, the barnyards, and the stables. A well so placed that surface filth drains toward it, as when the house or the outbuildings

are on higher ground than the well, is *almost certain to become impure.* A good example of a dangerous well of this sort is shown in the picture.

The only safe wells are *artesian* wells. These are made by driving an iron pipe into the ground until it passes through rock. What is called "second water" is thus reached, and this is perfectly safe and usually plentiful. Certain towns in the Philippine Islands have been supplied with artesian water. In these towns only half as many people die each year as in places where other water is used. Often the source of the water supply of a city or town is of necessity a long distance away. In some countries the water is brought to one's door in jars carried on the head. The entire supply of a town may be peddled from water barrels drawn from door to door. In these days the more common method is to convey small supplies through pipes and larger quantities by tubes or acqueducts. Of course, all pipes and acqueducts ought to be made so that water can be kept pure. Pipes made of lead are likely to poison water, and they should be avoided. Pipes of iron and earthen ware are safer.

One of the greatest acqueducts in the world was built to bring good water to the city of Los Angeles, California. On the slope of the Sierra Nevadas, four thousand feet above sea level, is a river, fed by the melting mountain snows. It used to flow into a dead lake, more than one hundred square miles in area. By intercepting this stream above the lake and turning its channel so

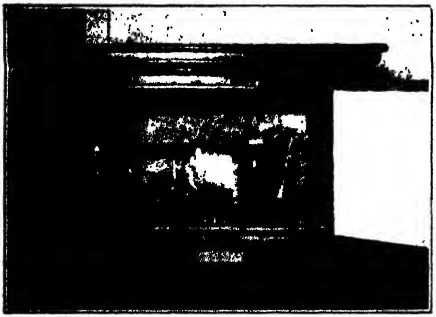
that the water flows into immense storage reservoirs, an abundant water supply is thus secured. To get the water to the city was a great feat. The heart of rugged mountains had to be pierced; forty-three miles of tunnels had to be built; and more than two hundred miles of desert had to be crossed before the water, brought through cement lined and covered conduits at some points, finally reaches the city.

THIS WATER THAT LOOKS AS CLEAR AS A CRYSTAL MAY HAVE DEADLY GERMS IN IT.

A pure water supply sufficient for all its citizens is a necessity for every city. If pure, "natural" water cannot be obtained, then the water must be purified. Do you think this is always necessary when water from a lake or river is used? Why? Such water may be rendered pure and wholesome by special *filtration*. Many cities are now supplied with filter plants by which the public water supply is rendered pure and safe.

It is the duty of every city to provide pure water for its inhabitants; but this is not always done, so

that we sometimes have to look out for ourselves in respect to this matter. No one wants to drink water that looks dirty, or that has a bad taste. But water may be clear as a crystal, and be fresh and cool, and still have deadly germs in it. We cannot tell whether water is pure by its looks. The sure way is to find out its source. Sometimes this is known to be bad, and then those who look after the health of the city send out a warning, telling the people *to boil the drinking water.* If these warnings were always heeded, thousands of people would be saved from sickness and even from death. Remember that *boiling kills bacteria.*



IT IS BETTER TO COOL WATER BY PUTTING IT *on* ICE THAN BY PUTTING ICE *into* IT.

Some people attach small filters to their faucets, because they think they can in this way make the water safe. But the germs will remain just the same, even if the dirt is filtered out of the water.

Boiling, as we have seen, is a sure way of killing disease germs; but what do you think about freezing them? Does freezing kill every growing thing? Think of grass, bulbs, buds on the trees, and the like.

Ice is frequently gathered from ponds and other

bodies of water that would be unsafe for drinking. Sometimes when snow falls on the growing ice crop, the boy with his skates and the man with his saw become quite impatient. The snow puts a stop to the freezing, and the impatient ice man sometimes floods the crop with impure water, and all the germs that it contains are frozen into the ice that is to cool our drinking water. You can see for yourself that it is best not to add such ice to water or other drinks. A much better way to cool foods or drinks is to surround the vessel containing them with ice. This will cool the contents without doing any harm.

I suppose you know that manufactured ice is usually made from distilled water, and when this is the case, it is of course safe to use. By the way, what is *distilled* water? Could you tell the class how to get some at home easily?

REMEMBER: To get a safe supply of water for a home, a town, or a city, there needs to be: (1) a pure source of the supply; (2) clean storage; (3) safe conveyance from the source to one's home; (4) no chance anywhere along the way for disease germs to get in. In short, it must be *clean* from start to finish. Clean water is the only safe water. Clean ice, too, is necessary for health.

HEALTH PROBLEMS

1. Might drinking water look clean and sparkling, and still be unclean and dangerous? Explain.

2. Suppose you are going along a country road, and you become thirsty. You notice a surface well by the roadside, in a field in which cattle and horses have been pastured, and the water is drawn up with a bucket. Would you take a drink? Why?

3. If you become thirsty on the train, do you think it safe to take a drink from the water can in the car? Why?

4. Have you noticed how train men handle the ice they put into water cans in cars? Is there danger from such methods? Why?

5. In some mountainous states, the streams, though they come from mountain springs, are very unsafe. Why should they be?

6. Suppose you go to live in a town which gets its drinking water from a creek or river, and you know that people living up the stream a few miles throw their sewage into it, bathe in it, drive their cattle into it to drink, and so on; would you drink the water? Could you make it safe in your home?

7. Is it a safe plan to drink out of creeks when one gets thirsty on a tramp?

8. Have you ever heard of a *driven* well? How was it made?

9. Is the water supply in your school building perfectly safe? How can you tell?

10. Is the water supply at your home safe? Describe your well or cistern, showing how it is made, where it is located, and so on.

11. Have you ever had an epidemic of typhoid fever in the community in which you live? If so, what was the source of the germs that started the disease?

12. How is the water in your city or town or country home purified?

Review Questions

1. What might you see if you should look at a drop of water through a microscope?

2. Are bacteria found in water everywhere?

3. What kind of water is free from bacteria?

4. In what kind of water would one be apt to find bacteria most abundantly?

5. Where does the water on the earth come from?

6. Tell the story of the "water circle."

7. When rain falls through the air, is it likely to gather up bacteria? Why?

8. When it falls on the soil, is it likely to gather up germs?

9. Is water in lakes, rivers, and so on likely to become *contaminated* — that is, to get harmful bacteria?

10. What diseases are likely to be caused by drinking contaminated water?

11. How many bacteria would have to be put together in a row to make one inch?

12. How many can pass through the finest hole in a strainer at the same time?

13. Some people think bacteria are so small they cannot do any harm. What do you think about it?

14. Might one get typhoid fever without drinking water containing typhoid germs? How?

15. How can a person who has typhoid fever, and who works in the kitchen, give the disease to all the members of the family?

16. How should the discharges from a person who is sick with typhoid fever be treated? Why?

17. Can typhoid fever germs survive freezing?

18. Suppose one cools his drinking water with ice from a contaminated stream or lake. What may happen to him?

19. How does Nature purify the contaminated water of a stream or a lake?

20. Why is evaporated water pure?

21. Is rain water always pure? Why?

22. If rain water is to be used for drinking, how should it be caught and stored? What kind of tank is best suited for storing rain water?

23. Is water that comes from deep under the ground pure? Why?

24. What is an artesian well? Is water from such a well likely to be pure?

25. Is a stream which flows from such a well always pure? What may contaminate or *pollute* the water? (*Pollution* means making water bad and dangerous, because it contains harmful bacteria.)

26. What sort of water is most likely to be polluted? Why?

27. Are "dug" wells, that is, wells that go down only a few feet in the soil, likely to be easily polluted? Why?

28. What care should be taken to locate wells in a safe place?

29. What is likely to contaminate "dug" wells or cisterns, into which surface water may drain?

30. Should your city provide pure water for the people? What care must be taken to get the water from a pure source and to keep it pure until it reaches the one who is to use it?

31. If one suspects that his drinking water has become contaminated, how can he purify it?

32. Can one purify polluted water by putting filters on the faucets in the house? Why?

CHAPTER XIII

Getting Pure Milk and Keeping it Pure

In the year 1892, 1000 babies died in the city of Rochester, N.Y. In the year 1904 there were 30,000 more people living in Rochester than there were in 1892; yet fewer than 500 babies died during that year. What made this difference in the death rate of the babies? Do you not think anything which would save the lives of six or seven hundred babies in a city in one year would be a good thing and of a good deal of value to the people living in that city?

Impure milk causes disease.

During the time between 1892 and 1904, a great campaign for clean milk had been going on in the city of Rochester. Before 1892 no one thought very much about getting clean milk. They said that milk was milk, and it did not make much difference how it was secured. But scientists who had been studying the matter were leading the people to see that many diseases, especially those of children, are due to impure milk. So some of the people of Rochester were determined that they would get a cleaner milk supply than they had been having. When this cleaner milk was at last obtained,

less than half as many babies died in the city as before the clean milk campaign began. When this fact became known, almost all the people of Rochester reached the conclusion that more than one half of the babies who had formerly died in Rochester were *killed by bad milk*.

The same thing is true in many cities and towns in our country to-day, because the people are not getting a supply of pure milk for their babies. Two billion gallons of milk, about enough to float all the ships in the world, are consumed in this country every year. Try to imagine what that means for the health of the people who use the milk. Doubtless you know that it is the chief food of children under five years of age, and is an important part of the food of many boys and girls up to fifteen or sixteen years of age. When it is pure, it is an almost ideal food, and physicians everywhere say that young people ought to use it freely. But when it is impure, which means when it is *polluted* or *contaminated*, it is as dangerous a food as one can take.

Do you realize that about four fifths of all the babies in the United States are fed on cows' milk? About one sixth of these do not live to be a year old. Most of the deaths occur because of the use of contaminated milk. During a period of four years (1900 to 1904) it is believed that at least 500,000 children died because they could not have clean milk. Of course, a great many more were made sick by contaminated

milk. Do you not see that milk, which should be the baby's most important food, may become its deadliest enemy? If children cannot have pure food, they cannot become strong men and women, can they?

During the year 1911 there was in Boston and vicinity an epidemic of the disease known as tonsilitis, which you will readily see from the word itself is a disease of the tonsils in the throat. During this epidemic, 1000 persons were taken sick, and 48 of them died. An investigation showed that nearly all of these people had been taking their milk from the same dairy; and the cause of the disease was traced to the milk of a certain farm which was supplying the dairy. It was not alone babies who were made sick by this polluted milk, but grown people as well were attacked by the disease. This shows that almost all the people in a community are likely to be taken ill if the milk supply is impure.

When Theodore Roosevelt was president, he ordered that an investigation should be made of milk supplies in different communities. He asked the surgeon-general of the army to conduct the investigation. In his report, the surgeon, Mr. Wyman, said that at least 500 epidemics in this country had been traced to a contaminated milk supply. He gave the following number for each epidemic: 317 epidemics of *typhoid fever*, 125 epidemics of *scarlet fever*, 51 epidemics of *diphtheria*, 7 epidemics of *pseudo-diphtheria* (a disease much like diphtheria). There have been a great many

epidemics since then due to polluted milk. Just think of all the disease, suffering, misery, and loss of time and money which impure milk may cause, when the milk could easily be made clean and wholesome. How much money do you suppose was lost by all those epidemics, counting in everything?

A BOTTLE OF MILK MAY CONTAIN TYPHOID GERMS ENOUGH TO GIVE THE DISEASE TO AN ENTIRE FAMILY.

When a person becomes ill with typhoid fever, he is likely to lose almost a year before he can do full work again. Then he has to have people wait on him, physicians to attend him, and often the members of his family are made very uncomfortable during his illness. You can see what it means to have an epidemic of typhoid or any other disease. Often when one gets scarlet fever, he never recovers from it fully. I know a boy fifteen years of age who had scarlet fever three years ago, and he is still unable to do very much work. He has lost three years in school, has caused his parents a great deal of worry,

and has cost them a great deal of money. Besides he was very miserable himself; and all this pain and trouble was due to the carelessness of some one in polluting the milk which the boy was using. Do you not think everything possible ought to be done to prevent such misery and loss of life and happiness?

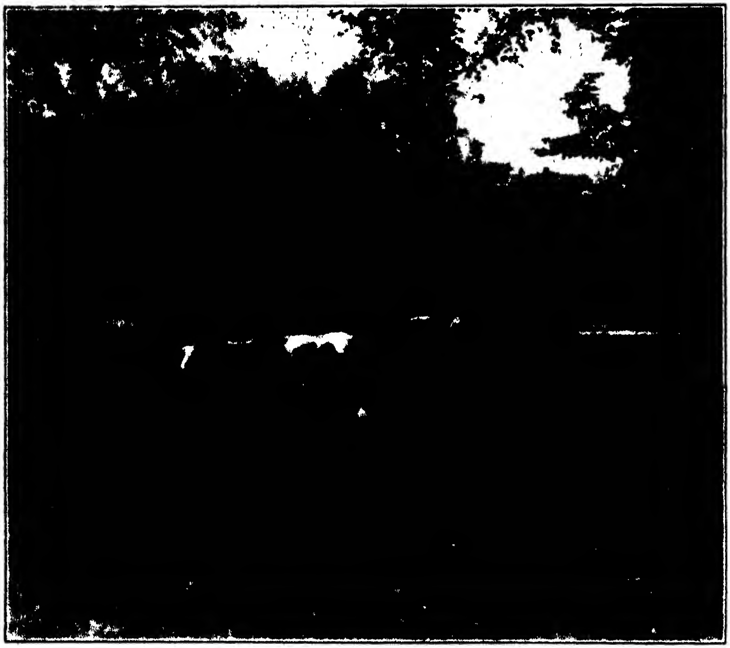
The spoiling or pollution of milk usually takes place after it leaves the cow. At the same time, the purity of the milk is greatly influenced by the condition of health of the cow. Three things are necessary in order that a cow may give healthful milk: (1) She must be fed on good, wholesome food, and be given plenty of clean water to drink. (2) She must be well cared for. (3) She must be healthy.

Only a healthy, well-cared-for cow gives good milk.

If possible, a cow should live out in the open air, in the sunshine, and she should be cared for in a thoroughly clean stable, where there is an abundance of light and air. Are the cows in the community in which you live cared for in this manner? Do you know any farms or dairies in which the cows are kept in dirty stables without a sufficient amount of air or light?

Not long ago, twelve girls in a young ladies' boarding school in Paris, all of whom had healthy parents, became ill with tuberculosis, and five of them died. It seemed impossible to trace the source of the disease; but finally it was found that the cow which furnished the school with milk was the cause of the disease. She was examined and found to have tuberculosis.

How many cows in this country have tuberculosis? I saw an estimate recently that over a million cows were suffering from the disease. It is not possible to tell from the looks of a cow whether she has the dis-



COWS CANNOT BE HEALTHY UNLESS THEY ARE OUT IN THE OPEN AIR MUCH OF THE TIME.

ease or not. The only way to find out is to have an expert apply what is called the *tuberculin test.* By means of this test, it can be easily ascertained, without doing harm to a cow, whether she has the disease. It

is important to detect any case of tuberculosis in a herd of cows, because if any one has the disease, and her milk is mixed with the milk of the healthy cows, the supply of the entire herd is likely to become polluted. I suppose you hardly need to be told that when cows are kept in dark, dirty, unventilated sheds, they are much more likely to get this disease than when they are kept in light, clean, airy stables.

There are many things which will injure the cows' milk. An inspector was visiting a farm recently, and noticed some boys chasing the cows out of the pasture just before they were milked. The owner was asked why he did not prevent the boys from doing this, and he said he thought there was no harm in it. He was astonished when he was told that frightening a cow injures her milk and may make it unhealthful for the baby who drinks it. Why should this be so? Do you know whether it is bad for a person to be frightened? Scientific men say that when one has been frightened, his blood will show it because it will not be quite as healthy as it was before.

Many years ago a New York gentleman visited a distillery to try to persuade the owner to put his money into a better business. You know a distillery is a place where whisky and similar drinks are made from corn and other grains. While this gentleman was at the distillery, he noticed that the slops from it were being carted to cow stables near by. He made an examination, and he saw that there were nearly

one hundred dirty cows kept in these stables and they were being fed on this distillery waste. Now, the waste from a distillery consists very largely of acid water, and the cow has to eat a great deal of this every day in order to get enough nourishment. Do you think cows fed on such poor food should be allowed to furnish milk for children, or for grown people either?

Mr. Hartley, the New York gentleman who saw this, went home and published the story of what he had seen. The people who read it were angry, and this is what started the first pure milk campaign in this country. As a result of this, the Legislature of New York state passed a law in 1864, declaring that every baby has the right to have pure milk for its food. When this was passed, little was known of the chief source of polluted milk. Shortly afterward, a man happened to notice that a number of kittens which were fed on the milk supplied to a certain hospital died after a few days. Previous to this, no one had thought that the milk was not of good quality, and it had not occurred to any one that it might be adulterated. But the man who observed its effects on the kittens concluded that there must be something the matter with it. So he tested the milk for bacteria, and he found in one teaspoonful several times as many germs as there are people in the United States. He then got samples of milk from different parts of the city and tested them, and they were all found to contain large numbers of germs.

When the facts became known, the people started a vigorous crusade to get clean milk. Investigations were made in order to find out if possibie how all these germs got into the milk. As it comes from a healthy cow, milk is generally quite free from germs, except the very first milk which is drawn, — the "foremilk" as it is called. It must be plain, then, that the vast number of germs found in ordinary milk must get into it somewhere on its way from the cow to the *consumer*, that is, the person who uses it for drinking or cooking.

Clean methods of milking are necessary.

In the city of Naples, the milkman drives the cow or goat to the houses where the milk is wanted, and the people get it fresh into their milk pails. It is easier to secure clean milk in this way than when it is delivered as it usually is in our own country. Recently some milk inspectors were sent out to find the cause of the bad milk supply in a city, and on some of the farms which they visited they found that the bodies of the cows were covered with dirt and flies. When it came to milking time, the cows were driven through barnyards full of liquid filth standing in pools. They were put in dark, dirty stables with dirt floors, and there were sinks of mud and filth everywhere. The men who did the milking wore their ordinary working clothes, — the same clothes they had on when they cleaned the hog pens, the chicken coop, and the swill barrel. They sat on stools that had been used for

years without being cleaned. When they began to milk, they first moistened their dirty hands with the milk, and rubbed some of it over the cow's udder so that the milking would be easier. Some of this unclean stuff dropped down into the milk pail. Hairs from the cow, dust, and various particles of dirt that had clung to the cow fell into the pail with the milk. Every time the men moved around, they stirred up dust from the old straw on the floor, and it also got into the milk. The utensils used for milking were not thoroughly cleaned, and some of them even contained layers of sour milk. Now, what condition should you expect the milk to be in which came from this place? Should you like to drink it yourself? Do you think a tender baby could drink it and thrive on it?

Should a man be required to have on clean clothes when he draws milk that is to be used by babies, or by grown people either?

Did you ever notice in the bottom of a milk bottle or pitcher a dark, dirty-looking sediment? If you had observed the milking in the stables described above, you would know what this sediment is and where it comes from. Do you not think that the

person was right who said that milk is the dirtiest food that comes to our tables? Some scientific man has calculated that at least 300 *pounds of dirt* are consumed *every day* in the milk used by the people in New York City.

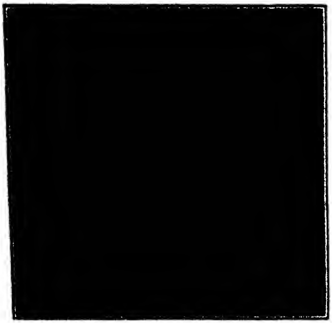
Of course, the worst thing about this dirt in the milk is that every particle is likely to carry with it a great number of germs, some of which may be very harmful. Over one thousand germs have been found on a single cow hair. Some one has estimated that at least three thousand germs per minute are added to milk in a pail, from the dust that is raised by throwing down hay or kicking straw around while the milk is standing in the stable. It would be so easy to take the milk to a place where it would be free from pollution and dust!

The dirty milkman usually thinks that all he has to do to make his milk clean is to strain it. Of course, this does remove the large particles of dirt, and this helps a little. But you know that deadly germs can pass through the very finest cloth. Indeed, they can go wherever the milk itself can go. When they have once got into the milk, there is no way to get them out, although they can be killed by boiling or by putting in what is called a *germicide*, or a *germ killer*. But milk is not quite as good when it has been treated in this way as when it is "raw" or "natural." "Natural" milk is the best milk for everybody, provided it can be kept clean.

There is something else, too, besides cleanliness that determines the number of germs in the milk supply.

Milk should be kept cool.

You have learned about the rapidity with which germs multiply when they have just the right conditions. Milk is a splendid food for germs; they like it and thrive on it about as well as babies do. So you can see that germs multiply very fast in milk. From one germ that gets into the milk, 200 may be produced in three hours, 10,000 in six hours, 10,000,000 in nine hours, and 2,000,000,000 in eighteen hours. The longer the milk is kept, of course, the more germs it will contain. So you can realize that the cleanliness of the milk depends upon its *freshness*, as well as upon the cleanliness of the milking. You know that germs cannot grow in a temperature that is too cold for them. You must have discovered already that when they are frozen, they do not multiply, though they may keep alive. But when warmth comes, they begin to increase. The ordinary temperature of milk — anywhere from 65 degrees to 100 degrees — is just right for them.



GERMS GROW WITH GREAT RAPIDITY IN WARM MILK.

How, then, can they be prevented from multiplying in milk? You will see that this can be done by cool-

ing the milk at once after it is drawn, and bringing it down to a temperature where the germs will grow very slowly if at all. When milk is cooled right away after the milking and is kept at a temperature of about 45 degrees until it reaches the person who is to use it, the germs will be prevented from multiplying very rapidly. Suppose the milk has to go from the country farm to the city, how ought it to be carried in order to keep the germs from multiplying?

MILK OUGHT TO BE COOLED AS SOON AS IT IS DRAWN.

When milk is delivered to the person who is to use it, it should not be above 50 degrees, and it should be kept at this temperature until it is used. It is important to remember this in keeping milk in the house. Experiments have been made with milk by keeping it for a certain time at different temperatures. All the milk to start with contained 1500 bacteria to each drop. The following table shows the number of bacteria found in each specimen after twenty-four hours according to the temperature at which it had been kept:

Summer heat, 94°	1,000,000,000
Living room, 68°	200,000
Cool cellar, 55°	10,000
Refrigerator, 45°	2,000
Packed in ice, 35°	1,600

You can easily see from this table that the cooler the milk the fewer will be the germs contained in it. So there are three things that influence the number of germs in the milk:

1. The number of germs that get into the milk. It must be *clean*.

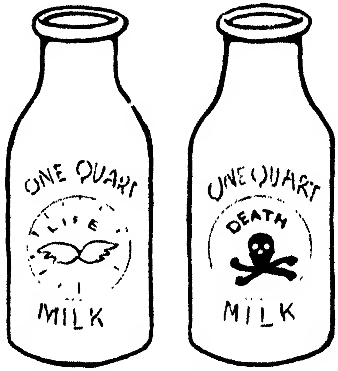
2. The time which they have had to develop. It must be *fresh*.

3. The temperature at which the milk has been kept. It must be *cool*.

There are two hundred different kinds of bacteria found in milk. Most of these are not harmful; in fact, some of them are even beneficial. Do you know that the souring of milk is caused by bacteria? *Clean*, sour milk is perfectly healthful. However, even where the germs are not harmful in themselves, milk that contains them in very great quantities is dangerous, partly because of the substances which they produce in the milk.

Cholera infantum, and other bowel troubles, of which so many babies die in the hot weather, are nearly always caused by the germs that are in milk. It is not always one particular kind of germ, but the great number of all kinds that increase in the milk so

rapidly in hot weather and the poisons formed by them that cause the trouble. The milk might not injure a grown person; but a little baby, weakened by the heat, cannot resist these multitudes of germs. It has been decided by the proper authorities that milk is dangerous when it contains more than 100,000 germs per cubic centimeter. What part of a teaspoonful is a cubic centimeter?



A BOTTLE OF MILK MAY GIVE LIFE AND HEALTH, OR DISEASE AND DEATH, ACCORDING TO WHETHER IT IS PURE OR IMPURE.

You must remember that a milkman may sell milk containing the germs of *tuberculosis*, *typhoid fever*, *scarlet fever*, *tonsilitis*, or *diphtheria*. Now, we know that cows do not suffer from any of these diseases except tuberculosis. How, then, do these deadly disease germs get into the milk? Sometimes they are introduced into it by the milker. A hundred persons at Ashtabula were at one time made sick with diphtheria. The germs came from a man who had a light case of diphtheria, and who was working in a dairy which supplied these persons with milk. At Port Jarvis, one year, one hundred forty-eight persons had typhoid fever. It was found that they had been getting their milk from a dairy where there were three cases of this disease, and

the dairy utensils were washed in the house and wiped on towels that were used by the people there. In Stamford, Connecticut, there were, not long ago, three hundred eighty-six cases of typhoid fever, and three hundred seventy-six of these persons were served by one milkman. It was found that the epidemic was caused by washing the milk cans in water that had typhoid germs in it.

The rapidity with which germs multiply in milk makes it a very dangerous carrier of disease germs. A single germ of diphtheria dropped into a milk can will multiply in twelve hours into 100,000. As you know, the body has the power to resist germs if they are not too numerous; but when they attack it in great numbers, it may be overcome; just as a fortress that might be able to resist the attack of a few enemies might not be able to withstand a great army.

Certified milk.

When the pure-milk campaign was started in Newark, New Jersey, a children's physician (Doctor Coit) made arrangements to give certificates of excellence to any dairyman who would produce good, safe milk that the people need not be afraid to use. A special dairyman was chosen and shown how to use all the best sanitary methods. Once a month the milk and the cows were examined by experts; and when the milk had reached the proper standard of excellence, a certificate was given to the dairyman. Copies of this certificate were sent to the physicians in the town where the milk was delivered.

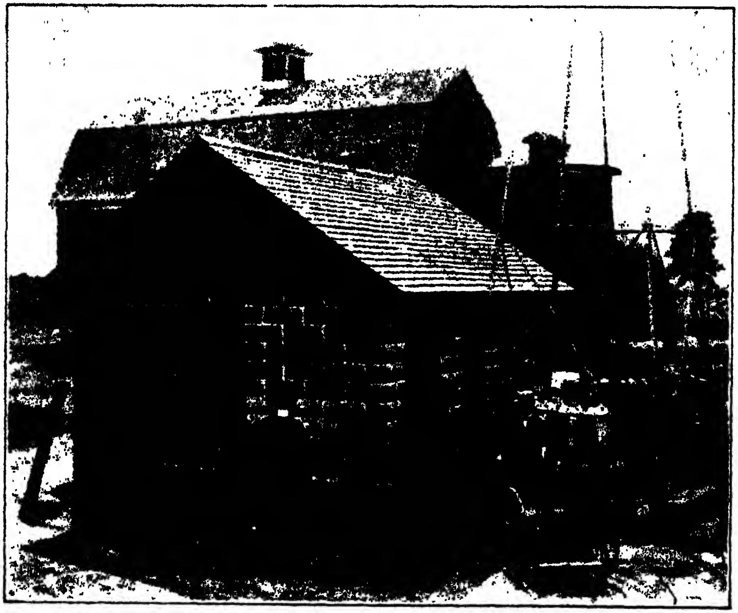
The families where there was a baby or an invalid depending on the milk supply were very glad, of course, to get this *certified milk*, and the business of the dairyman began to flourish.

The success of this movement was noticed in other cities, which soon followed in the production of *certified milk*. In some cities, milk laboratories having expert examiners were established. In Boston, Rochester, and some other large cities, these milk laboratories are connected with model dairy farms, where the cattle are kept and the milking is done under the very best conditions. The cow stables are built and painted in such a way that they can be thoroughly washed and disinfected. They have windows along each side and ventilating shafts in order to make them both light and airy. The milk house is an entirely separate building. The cows are treated kindly and never spoken to harshly. They are groomed daily with brush and currycomb; and before each milking the udders and flanks of each cow are carefully washed with a clean sponge and wiped with a clean towel. The milking is done in a place as free from dust as possible, and it contains neither straw nor hay.

The milker, too, must be clean. At one farm the milkers are compelled to take a shower bath before they commence work. They are provided with special wash suits, made clean for each milking. The clothing of each milker receives a thorough cleaning in boiling water after it has been used, and it is then locked in

an air-tight drying room, where it is disinfected and dried by steam, remaining there until it is wanted again.

The milker is supplied with a pail and stool, both of which have been thoroughly cleansed since they



A MILKMAN SHOULD BE REQUIRED TO PREPARE THE MILK FOR CUSTOMERS IN A SPECIAL MILK-HOUSE.

were last used. Layers of cheesecloth are stretched over the top of the milk pail, and the cow is milked directly through this cheesecloth into the pail. The "foremilk" is taken into a separate pail and thrown away.

When the milk is drawn, it is taken at once to the milk house, where it is bottled and cooled as soon as possible, and each bottle is carefully sealed. The bottles are then placed in shipping trays or boxes, covered with broken ice, and shipped to the different city stations. All milk is sent by express train and properly iced while it is on the road.

Returned empty bottles are washed in four waters. In the final rinsing, they are turned over nozzles that spray fresh water into them. All utensils, including the strainers, are first washed thoroughly and then rinsed in boiling water or treated by live steam.

You have some idea now of what is meant by "certified milk." It is raw, natural milk, guaranteed by medical men to have been obtained from healthy, well-fed cows, which are kept in sanitary quarters. The milk is drawn by healthy milkers into clean receptacles and in a clean atmosphere. It is bottled direct from the cows in the country, cooled, and shipped with the greatest speed to the people who use it.

It costs something to get such clean milk, and if we want it, we must be willing to pay for it. The price of certified milk varies in different cities from eight to ten cents a quart. In some cities there are diet kitchens where mothers who cannot afford to pay for certified milk for their babies can get good milk at a very low price.

If we cannot afford certified milk, which is guaranteed not to contain more than 50,000 germs to the

teaspoonful, the next best thing is to get *inspected milk*, in which not more than 500,000 germs in each teaspoonful are permitted by law. Inspected milk

NOTE CAREFULLY ALL THE CONDITIONS IN THIS STABLE.

costs no more than ordinary bottled milk, but it comes from a sanitary farm, where cows, cans, and bottles are reasonably clean, though the rules are not so strict as for certified milk. Ordinary uninspected milk may contain anywhere from 1,500,000 germs in summer to 25,000,000 in winter in each teaspoonful. The "dip milk" which is sold cheap at the corner grocery in the

tenement district kills one out of every four babies that are fed on it.

Although the germs cannot be removed from milk

THEN NOTE THE CONDITIONS IN THIS ONE. FROM WHICH WOULD YOU LIKE TO GET YOUR MILK?

after they have once got into it, they may be killed, and so prevented from doing any mischief, by a method which is known as *Pasteurization*. This kills the disease germs; but it kills also the beneficial germs along with the disease-producing ones. The milk also loses some of its nutritive value. Babies fed on *pasteurized* milk do not thrive as well as those fed on *certified* milk.

Pasteurized milk.

One may easily pasteurize milk at home. The

Department of Health of Chicago recommends this method:

"In a small tin pail place a saucer. On the saucer stand the bottle of milk (leaving the cap on the bottle). Now put sufficient hot water (not so hot as to break the bottle) into the pail to fill same to within three or four inches of top of bottle, and then stand the pail and its contents on the stove. The instant the water begins to boil, remove the bottle of milk from the pail and cool it as rapidly as possible.

"Keep the bottle of milk in the ice box and keep the cap on the bottle when not in use. When you remove the cap, do so with a clean fork prong, and be careful that the milk side of the cap does not come in contact with anything dirty."

We need to keep the household milk in perfectly clean dishes. A piece of cheesecloth over the top of the dish will keep out dust and flies. One thing it is well for every one to heed: when the milkman brings the milk, *put it at once in a cool place.* To let it stand on the porch or elsewhere in the sun for even half an hour may sour it. Before opening the bottle, wipe the mouth with a clean damp cloth. Dust may have settled there. If the milk is not delivered in bottles, a mason jar or some other *covered* dish should be put out for it. The colder the milk is kept, the longer it will keep sweet.

REMEMBER: Pure milk is an ideal food; but when it is contaminated, it may become a deadly poison, especially to babies. So every precaution should be taken to have milk wholesome when it comes from the cow, and to keep it pure and fresh until it reaches the one who is to use it.

Health Problems

1. If you live in the country, describe how the cows are cared for from which your milk supply is gained. Be careful to give an exact description according to the following:

a. Are the cows cleaned before milking is begun?

b. Do those who do the milking change their work clothes before milking is begun?

c. What is done with the milk immediately after it is drawn?

d. Have you ever noticed sediment in the bottom of the milk pans or bottles in which the milk is kept?

2. If you live in the city, give an account of the way in which milk is brought to your house. What is the temperature when it reaches the house? How is it kept until it is used?

3. If you live in the city, be sure to make a visit to the dairy which supplies your milk, and describe the conditions exactly as you find them. Tell about the stables; are they fresh and light, or dark and dirty? Are there good floors? Are the stables clean and wholesome? Are the cows kept in the stables most of the time, or are they out in the pasture, or in the barnyard? Describe the condition of the barnyard.

4. Find out the source of the drinking water of the cows that supply your milk. Is it of any importance to give attention to this matter? Why?

5. Has there ever been an epidemic of typhoid fever or any other disease in the community in which you live that has been traced to the milk supply?

6. Is there any law in the community in which you live requiring that cows be tested regularly for tuberculosis? If there is no such law, do you think one ought to be passed?

7. Do you know any milk dealer in your community who delivers his milk in open cans? Is there any danger in delivering milk in this way?

8. How does the dairyman who furnishes you with milk clean his bottles? How should he clean them? Why?

9. Have you known of people who take sour milk as a part of their regular food? Why do they do this?

10. Some of you may know a person who uses what is called *Metchnikoff* sour milk. If you can find such a person, ask him why he uses it.

11. Can you get *certified* milk in your community? Could every farmer produce certified milk on his own place if he desired to do so? How?

12. Do you know of any place where people speak roughly to the cows or frighten them by setting dogs on them and in other ways? What harm is there in this, if not to the cows, then to the people who use their milk?

Review Questions

1. What was the difference in the death rate of babies in Rochester in 1892 and in 1904? What made this difference?

2. What is the cause of the death of many babies in the city?

3. How much milk is used in this country every year?

4. What is the food of most of the babies in our country?

5. Why is it right to say that the future of our country depends on having a pure milk supply?

6. How does milk usually become contaminated?

7. What three things are necessary in order that a cow may give healthy milk?

8. How can a cow suffering from tuberculosis be examined?

9. How did the people become aroused to the necessity of a pure milk crusade?

10. What is the meaning of "foremilk"? What should be done with it?

11. What is the meaning of the sediment at the bottom of a milk bottle or milk pan?

12. Will straining milk make it pure? Why?

13. How rapidly do germs multiply in milk?

14. Why is it desirable to use milk while it is fresh?

15. How can milk be treated so that germs will not multiply very rapidly?

16. What ought to be done with milk just as soon as it is drawn? Why?

17. What should be the temperature of milk when it is delivered to the one who is to use it? Why?

18. How many kinds of bacteria are found in milk? Are they all harmful?

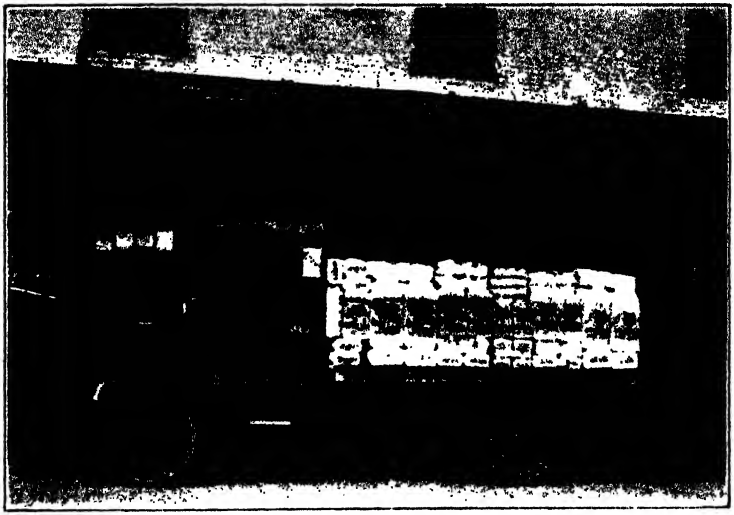
CHAPTER XIV

Getting Pure Food and Keeping it Pure

In early pioneer days, when our country was young, there were no cities and no factories. People lived far apart, and each family had to depend for its food chiefly upon its own *private supplies.* The people raised their own grain and had it ground into flour. They made sugar from the sap of maple trees. Their chickens supplied them with eggs, and their cows with milk. Each household prepared foods for winter use by drying, salting, and the like.

But as the country became thickly populated, most of the people gathered together in large cities, where it is not possible for them to produce their own foods. So they have to depend for it upon *public supplies.* The "milk train" comes in from the country early every morning, bringing from the farms the milk supply for a whole city. Our flour comes to us in barrels or bags from distant mills in the grain-growing sections of the country. We must purchase our meats from a public shop or market. Our eggs, butter, canned and dried fruits, and such articles come from public stores which supply many families. Of course, if you live in

the country, you may produce your own meat eggs, milk, and butter; but you probably buy your flour, sugar, fruit, and other foods from public supplies.



THIS FLOUR MAY HAVE BEEN MADE IN MILLS A THOUSAND MILES FROM WHERE YOU NOW SEE IT.

The adulteration of foods.

So long as each family provided its own food, it was easy to tell whether it was clean and of good quality. You may know, for instance, that the milk from your own cow is rich, fresh, and pure. But the milk you buy from a city store may, perhaps, have had part of the cream removed; it may have had water, coloring matter, or some harmful substance added to it. Besides, it may be swarm-

ing with harmful bacteria. The bread made at home from wheat grown in your own fields and ground in a hand mill, you know all about; but the bread you buy at the store may have been made from flour from which the most nutritious portion was removed in the process of milling, and it may have had alum added to increase the whiteness. You probably know the age of the eggs laid by your own hens; but the "fresh" eggs you buy at the store may have been laid months before and packed and kept in cold storage.

You see, then, that in getting food from public supplies you run a big risk. The articles may not be what they appear to be. Sometimes a cheap substance is put into food instead of the real stuff. The material used may or may not be harmful; but the food is a cheat. This is called *adulteration* of food.

In all countries and in all ages it seems to have been the practice of dishonest dealers to *adulterate* food in order to make more money through its sale. When Plato, one of the ancient Greeks, was planning a model city, he declared that there should be "no adulteration of food and no tricks of trade."

Do you know that it is only within quite recent years that people in this country have begun to find out the extent to which adulteration of foods is practiced and the lack of care shown by dealers in regard to the purity of foods sold? Those who look after the health of the people in our country to-day are trying to get a pure food supply for the poor and the rich

alike. People who must purchase do not always have the time to examine foods closely, so in most cities now there are "food inspectors" who try to prevent adulteration of foods. There is a force of one hundred of these food inspectors in New York City alone. Every store in the city is visited twice a month in winter and three times in summer. The great wholesale houses are inspected daily, and a close watch is kept upon the meat markets and slaughterhouses. One result of this inspection is that unfit foods are sorted out, and enough such to supply a good-sized city are being constantly destroyed. In New York City, in 1907, 362,795 pounds of groceries and canned goods unfit for use were destroyed. What do you imagine became of all such foods before there were any inspectors?

Food is often adulterated by adding some cheaper substance to it. For instance, over 80 per cent of the canned meats tested in Boston were found to be loaded up with corn meal in order to give them substance and bulk. Thus you see the manufacturers were selling canned corn meal with a chicken flavor for the price of full-grade canned meat. It used to be the case that what was sold as "pure white clover honey" was often made from corn and was "glucose," an artificial sugar, instead of real honey gathered from the flowers by bees. There are "jellies," too, made of flavored gelatine, with seeds of alfalfa and clover added to make them look like strawberry and raspberry seeds.

A far more serious method of adulteration is the use of chemicals to preserve and color foods. Dye stuffs made from coal tar are used to color counterfeit materials. In a little booklet sent out by the United States Department of Agriculture to various schools and colleges, there are samples of cloths presented which have been colored with the dyes secured from such foods. One sample is a brilliant cardinal, the dye for which had been obtained from "blood peaches." Another sample is a bright orange, the color of which had come from bottled "orange juice." Still other samples are green and purple, the color for which had been derived from preserved cherries and plums.

Harmful coloring matter used in foods.

Cheap candies very commonly contain harmful coloring matter and other adulterants. Sweetened tallow and grease form the filling of certain chocolate creams. Until a few years ago, nearly all candy manufacturers used *shellac* for coating chocolate. Then the government forbade its use. The honest manufacturers stopped using it, but the dishonest ones kept right on. At the New York Pure Food Show in 1910, one of the exhibits consisted of three bottles. In Bottle No. 1 there were what seemed to be candy-covered peanuts. In Bottle No. 2 there was the same kind of peanuts after the coating had been taken off; and in Bottle No. 3 was the coating that had been washed off—*four ounces of furniture shellac or floor polish*. Many shiny candies get their polish just as woodwork does, — by a coat of

varnish. There was also a jar of candies at the Food Show that had been colored with sweetened house paint of a brown color. One of the exhibits was a doll dressed in gaudy clothes that nad been colored with coal-tar dyes got from candy and ice cream. How should you enjoy eating your chocolate candies, if you knew you were swallowing floor polish or house paint?

WHAT IS FRANK PUZZLED ABOUT?

A food inspector who got employment in a candy factory to find out for himself all about the conditions there, said: "I have seen candy samples brought to the laboratories and boiled down; then rags were dipped in the stuff; and, after the rags were dried, no amount of washing would serve to remove the dye. Imagine putting such material in your stomach and then wondering why you are ill!"

You can try the following experiment for yourself sometime if you think there is any artificial coloring matter in fruit juice, jelly, tomato catsup, or confectionery. Boil some of the suspected substance; and, while it is boiling, put into it a small piece of nun's veiling or a good grade of white woolen dress goods. If the cloth is colored so that on washing it in cold water it still has a bright color, the color is evidence of the presence of some form of coal-tar dye. A single

glass of raspberry soda such as is found at soda fountains was found to contain sufficient coal-tar dye to color two yards of woolen cloth. Would not it be fine to drink a good lot of this soda? What color, do you suppose, a drinker of such soda would be on the inside?

Not long ago the Persian government forbade the use of coal-tar dyes in rug making, because they rot the fabric and injure the quality of the rugs. The French government appointed a committee which investigated fifty coal-tar colors. The committee reported that fifteen of the colors were known to be poisonous, and that twenty more were believed to be so. The United States government allows the use of but seven of these colors. Do you think, though, it would be wise to take any of them into one's stomach?

Harmful preservatives used in foods.

For a long time, certain firms that made a business of preparing foods for sale added such chemicals as *boracic acid*, *benzoate of soda*, *formalin*, *salicylic acid*, and *sulphites* to make the foods "keep" better. These *preservatives*, as they are called, do prevent foods from spoiling. Through their use, dishonest men are able to take garbage gathered from canning factories, — tomato skins, apple parings and cores, worm-eaten and decayed parts cut from fruit, and, after treating them with preservatives and with colorings, to sell them as tomato catsup, apple butter, soup, jam, and mincemeat.

Sulphite of soda and other chemicals are very gener-

ally used in making sausage. This is because sausage is usually made of odds and ends of meat which cannot be used in any other way. There is great danger in taking any of these chemicals into one's stomach. Do you know that decaying meats treated with preservatives and then canned and shipped to our soldiers during the Spanish-American war were the cause of a terrible outbreak of sickness and the loss of many lives?

Even good foods chemically treated are likely not to be of much use to the body. The United States Bureau of Chemistry, when Dr. Harvey Wiley was at its head, undertook to test the matter. A number of young men who were willing to make the test put themselves under certain rules of living. These young men, known as Dr. Wiley's "poison squad," were fed for weeks on foods containing preservatives, and the effects were carefully watched. After long and painstaking trials, it was concluded that chemical preservatives are all more or less harmful when used in foods. Should you expect anything different?

On June 30, 1906, the United States government passed what is known as the Pure Food Law. This does not forbid the use of preservatives and coloring matter in foods, but it requires that when they are used it shall be so stated on the label. This is a protection to those who do not want to use foods with chemicals in them. Should you not prefer foods that had not been treated at all?

When the housekeeper preserves her own fruits and vegetables, she is careful to use only perfectly sound, fresh products, in which decay has not got started. The only preservative that she uses is *heat*. By means of heat she destroys all the germs which cause decay, and then she carefully seals up her jars so that no more germs can enter.

Certain food manufacturers undertook some experiments to find out if it was necessary to use preservatives in food put up for public supplies. They proved that, when sound products are used, no preservatives are needed. The use of any preservative in food is therefore likely to mean one of two things: either that the food products were not of the best quality, or that they were not put up in a careful, clean, and sanitary manner. Do you not think this is reason enough for us to reject the preserved food, and choose that which is perfectly pure and free from harmful adulterations?

Careless handling often makes food impure.

There are other ways besides adulteration by which food may be made unsafe. Quite often the bacteria which are the cause of disease get into food through lack of care in handling it or storing it. Sometimes, too, foods contain the poisons which result from decay. Meat, eggs, and milk especially are very liable to contain these impurities. All animal foods decay, or, as we say, "spoil" very rapidly. When this process has begun in such foods, some very dangerous poisons, called *ptomaines* and *toxins*, are formed in them. Cer-

tain savage tribes poison their arrows by striking the points into the flesh of dead animals which have begun to decay.

Canned meats are the most common source of meat poisoning. When the meat is not properly cooked before it is canned, *ptomaine* poisons are likely to form in the can. These poisons are very deadly. They are much like the venom of snakes, and it does not lessen the danger to cook such food after the poison has formed. Do you think any amount of cooking will make spoilt food fresh and fit for eating?

IT IS EASY ENOUGH TO TELL WHETHER AN EGG IS FRESH.

It is best to use up canned foods, meats especially, very soon after opening. All canned foods when opened spoil more quickly than freshly cooked foods. Why? Canned articles need also to be removed from metal cans at once after opening. Why?

Wholesome eggs must be fresh. Of course, those laid by hens which have been fed on clean food are safest. It is not uncommon for eggs that have been packed and kept for months to be sold for fresh eggs.

If there is a doubt about the matter, one can make a test by holding a suspected egg between the eye and a lighted candle in a dark room. If it is a new-laid egg, an air space can be plainly seen between the shell and the lining at the larger end. This will be very small in a fresh egg. A large air space shows that the egg is old. If the egg is really bad, a number of dark spots will be seen. It helps in making the test to cut a circle about half the size of an egg in a piece of card-board, then hold it up to the light as shown in the picture.

Many foods are made unsafe because of carelessness in handling, and also because of dust and unclean methods in stores. For instance, bread may pass through half a dozen pairs of hands, from the time it leaves the oven until it is delivered at your door. Unless wrapped up it may gather a lot of germs on the way. It is not wise for one to buy food that has been exposed for sale uncovered, either outside or inside a store. Why?

A *culture* plate exposed under the glass show case in a clean bakery collected only fifteen bacteria in ten minutes, while a plate exposed on the open counter collected 800 bacteria in the same length of time. Fifty times as many germs fell on the exposed plate as on the one protected by the glass show case. On the same day, plates were exposed on a sidewalk fruit stand, and in ten minutes 10,000 bacteria were collected, while a plate exposed under a glass cover collected only

forty-one bacteria in the same length of time. So the food exposed to the dust of the street contained 250 times as many germs as that protected by a cover.

Would you say it is absolutely necessary that persons who handle food should be clean and free from

This grocery store was put on the "white list."

disease? Do you know of any manufacturers who provide their workers with a clean uniform each day and with caps for the hair? Is this desirable? Why?

Some women in a city I know devised the following plan to get clean, safe foods. They examined every store where foods were sold and made what they called a *white list.* Every salesman who was found to keep

his store clean and sanitary was given a big placard bearing the words "white list" to put in his window. This showed to all the world that his foods might be eaten without danger to any one's life. The women agreed to buy their foods only at stores on the white list. You can imagine what a cleaning up time there was. Clean hands, clean aprons, well-protected food, and a city full of neat and well-kept markets came from this campaign.

You may remember that intense cold checks the growth of bacteria, while intense heat kills them. Also drying removes the moisture necessary for germ life. All of these methods are used to preserve food. Storage in some cold place is the more common method of keeping fresh foods like fruits, vegetables, meats, milk, and eggs. Some of the ways in which this method is used are: suspension of the food in deep wells; storage in a cool cellar; covering over with ice water; the use of porous utensils hung in a current of air; the placing of foods in closed vessels and covering them with wet leaves or burying them in wet sand. Why should each of these methods be useful?

The best device for preserving foods by cold is an ice box or refrigerator, with which you are familiar, of course. But in the use of the refrigerator there is need for great care and cleanliness. My little friend Jane has for her share of the home work the care of the refrigerator. She keeps strict watch of the ice-man to make sure that he washes the ice well before

he puts it in the box. She knows that if it is lake or river ice it may have in it fragments of grass or leaves which, as the ice melts, may cling to the box or water pipes. So once each week she takes out all the ice and wraps it in newspapers to prevent waste. Then she removes all the food in the ice box and covers it from

WHY DOES JANE WRAP PAPER ABOUT THE ICE?

dust. Next she scrubs out the ice compartments and cleans the drip pipe through which the water flows away. This she scalds by pouring down it strong boiling *sal soda water*. She takes out the shelves and washes them well in a pan of hot soap suds, using a brush. After rinsing them she dries them.

All parts of the food chamber receive careful attention. Even the water pan is scrubbed. When all is clean and dry, the ice is put back, the shelves replaced, and the doors closed. As soon as the temperature within is cooled to 50 degrees, the food, too, is put back. Do you wonder how Jane knows when the box is cold enough? She keeps a thermometer inside

A REFRIGERATOR SHOULD BE THOROUGHLY CLEANSED ONCE A WEEK.

the refrigerator all the time, for she has found that the foods spoil in a refrigerator which gets warm, even more quickly than when they are kept outside in warm air. A thermometer is the only sure way to test refrigerator air. Jane tries always to keep it about 45° or 50°. Occasionally the ice gets very low. Then she takes the food out and keeps it out, until the iceman brings a new supply of ice, and the air in the food chamber

becomes cold again. Meanwhile, the foods are kept cool in some of the other ways of which mention has been made. Next time she gets more ice or takes better care of the ice so that it will not melt so fast.

Before storing foods in the ice box, Jane always puts them in clean dishes. Anything spilled in the food chamber is wiped up at once. Nothing is put in while it is hot or is giving off steam. Of course, the food chamber needs more frequent cleaning than the ice compartment. Every day Jane wipes the shelves; and twice each week, or oftener in warm weather, she gives it a thorough cleansing, which keeps it a sweet and wholesome place in which to store foods.

REMEMBER: Perfectly pure food is free from harmful preservatives and coloring matter; and in order to keep it pure, food must be carefully handled by clean people, and kept in cool, clean places.

HEALTH PROBLEMS

1. Does your family produce any of the food it uses? If so, mention each article.

2. Ask your father and mother whether they buy more of their food from public supplies now than their parents did, say twenty or thirty years ago. If there is a difference, what has caused it?

3. How does your family order its food from the public supplies, — by telephone, or by selecting it from direct examination?

4. Are there food inspectors in the community in which you live? If so, how many of them are there? Just what do they do? Have you known of their ever destroying any foodstuffs?

5. Can you tell by the "naked eye" when the foods bought at the stores are adulterated? Take canned fruits, for instance; how can you tell when they are adulterated as to color or flavor or quality?

6. Can you tell when candies are adulterated? How? Make a test of some cheap candy bought at a store, and give the results to the class.

7. What foods purchased from public supplies are in danger of being colored with dyestuffs? Why?

8. Get a sample of each of the common dyestuffs, and find out what canned goods resemble closely in color one or another of them. Would you be suspicious of such goods?

9. If you can, get some small samples at your home of *boracic acid*, *benzoate of soda*, *formalin*, *salicylic acid*, and *sulphite of soda*, so that you can show the class what they look like. You can get them at your drug store anyway. Why do they preserve food?

10. Do you know whether chemical preservatives are ever used in your family in canning fruits or vegetables? Ask your mother whether she thinks she can put up goods that will keep without using any of the chemicals mentioned above.

11. Have you ever heard of any one's being poisoned by eating canned meat or fish? Do you know whether oysters are likely to contain *ptomaines?*

12. Visit a bakery in your town or city, and tell the class what you think about the methods used to make the foods clean and pure. Are the persons who do the baking clean?

13. Visit a meat shop in your town or city, and tell the class whether the butcher takes pains to keep his meats pure and clean.

14. Is there a *white list* of stores in your city? If not, would it be well to have one? Why?

15. Look into your ice box when you go home, and say whether you think it is a thoroughly sweet and wholesome place in which to store food.

Review Questions

1. How did each family get its food in the early pioneer days?

2. How do people in the city get their food to-day?

3. Explain how we secure the different articles which we use.

4. Why is it difficult for people to-day to tell whether their food is pure?

5. What are the dangers in securing food from public supplies?

6. Why have food inspectors been appointed in large cities, and what is their work?

7. What does it mean to *adulterate* food? Why do men adulterate food?

8. Do the inspectors find much food that is not fit to eat? What do they do with it?

9. What is a common method of adulterating canned meats?

10. What is a common method of adulterating honey and jelly?

11. Tell about the adulteration of food with tar dyes.

12. Speak especially of the methods of adulterating candy.

13. What did the food inspector who got employment in a canning factory find with regard to adulteration?

14. What experiment can you make to determine whether there is coloring matter used in fruit juices, jelly, or confectionery?

15. Are coal-tar dyes harmful when taken into the stomach?

16. Mention some of the chemicals which are used in preserving foods. Do they make the food less healthful?

17. What is the "pure food" law? Is it necessary to have such laws in this country?

18. Does the careful housekeeper find it necessary to use preservatives in the fruits and vegetables which she puts up?

19. When a manufacturer must use a preservative, what is probably true about the quality of the fruit or vegetables he puts up?

20. What is the name of the poison which is sometimes found in canned meat or fish or oysters?

21. When poisons have been formed in a can, can you purify the contents by boiling? Why?

22. How soon after a can is opened should the contents be used?

23. How are people often deceived when they think they are buying *fresh* eggs?

CHAPTER XV

WASTING HEALTH AND MONEY

PASSING along a street in a city, one may often see a man or a boy blowing smoke into the faces of those he meets and leaving a trail of it behind to get into the eyes and nostrils of those who follow him. One who smokes habitually may have a very disagreeable odor of stale tobacco smoke in his breath and clothing, which makes him a nuisance to others even when he is not smoking. One does not like to sit next to him or to be shut up in a room with him. When tobacco smoking takes place in the home, everything gets saturated with the smoke and has the same unpleasant odor.

The smoker is a nuisance to others.

If the smoker could be made, like the factory, "to consume his own smoke," it might be better for the community, but it would be very bad for the smoker. If you want to know something of the nature of the smoke that he sends out into the air for you to breathe, let him blow the smoke upon a piece of paper held above his mouth until a cigar or the contents of a pipe is consumed. Then scrape from the paper the stain that is left there. If a small part of this should be

placed upon the tongue of a cat, its poisonous character would be proved by the death of the cat within three minutes. Do you think people should be permitted to pollute the air of the home or a public place with this poison?

If a person were to poison one's drinking water, no matter how slightly, or to enter a public place and fill the air with the dust or fumes of such poisons as Paris green, arsenic, or strychnine, he would receive very severe punishment. Should it be any different with the fumes of tobacco?

Tobacco poisons the smoker.

The cigarette smoker, by inhaling, actually does consume some of the smoke that he makes. You may get an idea of how much of the poison is retained by the smoker by having some one puff cigarette smoke through a handkerchief; and then, after inhaling the same amount of smoke, blow it out through another portion of the same handkerchief. You will notice that the discoloration on the handkerchief is not nearly so marked when the smoke was inhaled. In this case some of the stain was left on the bronchial tubes and in the lungs of the smoker.

When you consider what this poison would do to a cat, should you not expect to see some of its bad effects also on the habitual smoker? When you study the human body, you will learn what are the effects of the tobacco poison on the boy smoker — how it checks his growth, weakens his heart, shatters his nerves, and sooner or later ruins his character.

A well-known physician says: "I have never known a boy who began to smoke cigarettes under the age of fourteen and continued the habit, who was not a physical wreck before twenty-seven." The boy who smokes is not likely to be of much use in the world. Boys sometimes smoke in secret and think no one will know anything about it, but they cannot hide the habit for any great length of time. The results show plainly. A Chicago physician says: "I can pick out a cigarette slave almost as far as I can see him."

Some careful examinations were made of the students in two colleges, Yale and Amherst. It was found that those who did not smoke increased more rapidly than the smokers in weight, height, chest girth, and lung capacity. When the Japanese learned of these experiments, they said: "If we expect to make this nation superior to the nations of Europe and America, we must not allow our youths in common schools who are to become the fathers and mothers of the country in the near future, to smoke." So they passed a law forbidding the pupils in Japanese elementary schools to smoke or keep tobacco pipes.

A few years ago in England, when a committee of the House of Lords was considering a Bill to Prevent Juvenile Smoking, all the witnesses were agreed that "the habit of juvenile smoking produces indirectly a number of ills, facilitates the work of disease, and leads to habits of drink." Evidence was given showing that while there was marked physical inferiority

among the boys, there were no signs of such conditions among the girls. The reason for this was said to be that the girls were free from the habit of cigarette smoking and that this habit was increasing among the boys.

Laws have been passed in many of the states making it a crime to *sell or give cigarettes* to boys. Some states forbid the manufacture or sale of cigarettes at all. The Legislature of Illinois in 1907 passed a law containing the following clause:

Laws against smoking.

"That every person who shall manufacture, sell, or give away any cigarette containing any substance deleterious to health, including tobacco, shall be punished by a fine not exceeding $100, or by imprisonment in the county jail for a period not to exceed thirty days."

Illinois not only forbids any one to sell or give cigarettes to boys, but also, as do many other states, *forbids the boy to use the cigarette.* Here is another clause of the same law:

"Every person under the age of eighteen years and over the age of seven who shall smoke or use cigarettes on any public road, street, alley, or park, or other lands used for public purposes, or in any public place of business or amusement, shall be guilty of a misdemeanor and punished for each offense by a fine not to exceed $10."

These laws have been made to protect boys from the evils caused by tobacco. Do you not think there

should be some legal protection also for the non-smoker, who does not wish to be annoyed or poisoned by the tobacco smoking of others?

The smoker's selfish disregard of the rights of others has led to the forming of a league composed of some of America's most prominent men, called "The Non-Smokers' Protective league, of America." Its objects are to enforce all the laws that forbid tobacco smoking, to try to get more laws enacted, and to endeavor to prohibit by law smoking in the home. They think that the health boards ought to have just as much authority to deal with the tobacco smoker who poisons the inmates of his home as they have to remove cases of smallpox and other diseases which endanger the lives of others. What do you think about this?

Here is what David Starr Jordan, President of Leland Stanford University, says about the rights of the non-smoker: "As citizens of a republic and joint owners of the atmosphere, we, the one million men and the forty million women who do not smoke, have the right to ask the others to put away their cigars when they are in our company. We ask them for a free passage through the world, with *pure air all the way*."

There are over a million acres of land in the United States devoted to the production of the tobacco plant. This country might perhaps learn a lesson from China in this respect. You know China had a terrible struggle with opium smoking. Opium was introduced into

China in the seventeenth century, and by the beginning of the twentieth century it was estimated that there were from twenty-five to thirty million opium smokers in that country. Large areas of the best land, that should have been used for growing grain, were taken up in the cultivation of the poppy, the poisonous plant from which opium is made. Because of this there was always a liability to famine in China. Opium was also imported in large quantities, which took a lot of money out of the country.

The lesson China learned.

But the chief of the evils of the opium business was the disastrous effect upon the opium smoker. One who is a slave to opium becomes very pale and so thin that he looks like a living skeleton. He loses all desire to work and neglects his business, which is sure to be ruined. His character becomes so degraded that he will even sell his wife and children if necessary to obtain more opium.

At the beginning of this century, thinking and ambitious Chinese who wished to see their country rise to a level with the other great nations, made up their minds that they must get rid of opium. In 1906 an edict was issued directing that the growth, sale, and use of opium should cease within ten years. The government officials were asked to set an example to the people by breaking off the habit within six months. Those who did not do this were to withdraw from the service.

Three years later, in 1909, an English traveler investigating for the British government said that in traveling through a part of the country which in 1907 he had seen covered with the poppy, he did not then see a single poppy flower. You may know that there is a great awakening in China now, and it may be a strong nation again, which it never could be when thirty millions of its people were opium slaves. If we do not look out, we shall be in a worse way with tobacco in this country than China was with opium. What can you do to help to get rid of this evil?

REMEMBER: Smoking is injurious to others as well as to the smoker; for he poisons not only his own system but the air which others must breathe.

HEALTH PROBLEMS

1. Are there any laws in the city or county in which you live forbidding smoking in public places? Should there be such a law? Why?

2. Why has Nature arranged it so that often a boy is made deathly sick when he starts to smoke?

3. What should you think of a man who would breathe right into your face? Is it any better when his smoke blows into your face?

4. Why do smokers rarely if ever get good places on the teams in a school or college? Why will trainers take a fellow out of a team if he is detected using tobacco?

5. Why are a great many business men refusing now to employ any boy under eighteen who smokes? Is this the right thing to do? Why?

6. What are the signs, do you think, by which the Chicago

physician can tell a boy who smokes cigarettes as far as he can see him?

7. Ask any man you know who smokes whether if he were a boy he would smoke, and give his answer to the class. Get him to give you exact reasons.

8. In a certain tobacco state, the men who raise and trade in tobacco have been the most active in making laws to prevent boys from smoking and to punish those who sell cigarettes to boys. Why?

9. How much money would a boy waste in a year if he should smoke a box of cigarettes every day? How could he spend it so as to get more pleasure out of it?

10. How much money would a man waste in a year if he should smoke five ten-cent cigars a day? How could he spend it in a better way?

Review Questions

1. What sort of odor is a smoker likely to have on his breath and on his body? Why?

2. Is it true that a smoker is often a nuisance to others who do not smoke? Why? Should one who does not smoke be compelled to sit in a room with one who does? Why?

3. Should a smoker be compelled to consume his own smoke? Why?

4. What experiment can you make to determine what there is in tobacco smoke?

5. What would happen to a person if he should poison the drinking water of his neighbors? Is it any better for him to poison the air with tobacco smoke?

6. Does the cigarette smoker ever consume part of his smoke? How?

7. What happens to the lungs, throat, and nostrils of the cigarette smoker who inhales his smoke?

8. How can you tell whether tobacco smoke is a poison or not?

9. What effect does habitual smoking have upon a young boy?

10. Can a boy smoke in secret so that no one will know it? Why?

11. What laws have been made in different states with regard to the smoking of cigarettes by boys?

12. Why are laws made to prevent people from selling cigarettes to young people?

13. What did President David Starr Jordan say about the rights of people who do not smoke?

14. How much land in our country is devoted to the raising of tobacco?

15 Is opium smoking very much worse than tobacco smoking?

16. What change has come to China since the use of opium has been decreasing?

17. If American people do not restrain themselves in the use of tobacco, may they get to be as bad off as the Chinese were?

CHAPTER XVI

AN ACTIVE ENEMY OF HEALTH AND HAPPINESS

Alcohol injures the health.

MORE than one hundred years ago, in 1798, an Indian chief named Mechecunnequa, called "Little Turtle" by the white people, journeyed from Fort Wayne, Indiana, to Philadelphia to see the President. He said that during the preceding year three thousand of his Miami Indians had been destroyed by liquor, and he came to plead with President John Adams to stop the sale of alcohol to his people. He did not succeed that time, so in 1801 he journeyed East again and presented his petition to President Jefferson. The President sent a special message to Congress about the matter, and in 1802 an act was passed giving the President the power to take steps to stop the sale of liquor in the Indian country. That was the first law passed by Congress to control the liquor traffic in any way.

Something like this happened in England years ago, when a great African chief journeyed all the way to England to ask Queen Victoria to forbid her people to sell liquor to his people, because the African people were being ruined by it. It seems that these chiefs

were quicker to recognize the evil effects of alcohol upon their race than some of the rulers of civilized nations are.

It used to be thought that alcohol taken in moderate quantities was a strengthening food and quite a necessity for people who had hard work to do. It was given regularly to soldiers to sustain them in their long marches, and sailors had their daily allowance of "grog." Doctors ordered it for their patients and used it largely in hospitals.

Within the last fifty years, careful investigations made by eminent scientists and numerous experiments upon animals have shown that it is not a true food at all and that its effects upon the body are harmful. This has at last aroused the attention of the whole world and especially of wise rulers.

In nearly all progressive countries there is agitation against alcohol, for it is believed this is necessary in order to check certain diseases and crimes which have been increasing rapidly in civilized nations. The people who know the dangers of alcohol have formed *anti-alcohol* leagues and societies and are educating the people by means of lectures, newspapers, magazines, and statistical charts showing the effects of alcohol upon the body, mind, and character, and also its effects upon the community and the nation.

The effects of alcohol upon one who takes it habitually in large quantities are easily to be seen in the bleared eyes, trembling limbs, and complete change of

character of the drunkard. He loses his self-respect, becomes ragged and dirty, and neglects and ill treats his family. Do you think it is desirable to have such men in the community?

Even the moderate drinker is likely to suffer in painful ways of which you will learn when you study the human body.

But the drunkard is not the only sufferer from the alcohol that he drinks. Others have often to suffer for it even more than he does. In fact, the whole community where he lives feels the effects of it more or less.

Alcohol makes unhappy homes.

In the first place, the money that ought to be spent to make a comfortable home for his family and to buy food and clothes for his children goes into the saloon. The alcohol that he buys with it steals away his brain power and his strength. After a time he loses the power to earn money. His family suffer for food, clothing, and perhaps even for shelter.

When the father is a drunkard, the mother usually has to take his place and work to support the family. She has no time to care for her children and to keep the home clean and neat. Remember what you learned about the effect upon the community of one dirty, ill-kept home.

In an investigation of the cases of 352 able-bodied men in the city of Boston who failed to support their families, 243 (70 per cent) were found to be drunkards.

A former Commissioner of Labor says: "I have

looked into a thousand homes of the working people of Europe; I do not know how many in this country. In every case, as far as my observation goes, drunkenness was at the bottom of the misery."

A worker in the cause of temperance, in telling how she was led to take up that work, said: "I wanted a piece of ribbon once for my hair, as other little girls had. I asked my mother for it. She told me that the money for my hair ribbon had gone into the saloon. Again, I wanted a little white parasol, as other girls had. 'Your parasol is in the saloon,' my mother said. I went out into the woods and cut the white flower from an elder bush and played it was a parasol. My father saw me playing with it and struck me. I became unconscious. When I awoke, my head and arms were bandaged, and my mother was watching over me. I heard her say, 'A drunkard's home is no place for a child.' . . . I resolved to dedicate my life to fighting the saloons." You see how this child was made to suffer by alcohol's being sold in that community.

Other people have to pay the drunkard's bills and support his family. It costs the city of London five million dollars a year for the expense of its drunken paupers. Sir Victor Horsley says: "No teetotaler has been admitted to the gigantic workhouse at Wandsworth, London. All applicants for relief tell a story of alcoholism." Statistics show that 48 out of every 100 that enter the poorhouses of this country are brought there by alcohol.

Alcohol makes paupers and criminals.

In the manufacture of alcohol, millions of bushels of grain that would otherwise be used for food are wasted. Nearly four hundred years ago the great reformer, Martin Luther, said: "All Germany could live on the barley that is spoiled and turned into a curse by the brewer."

In the years 1809–1810 and again in 1813–1814, there was famine in Ireland. The distilleries were stopped, on the ground that they wasted the grain that might otherwise be used by the people as food. A remarkable result of the closing of the distilleries was this: During those years there was a tremendous increase in the amount of money spent in dry goods, blankets, cotton goods, sugar, groceries, hardware, crockery, and other necessities. The money that would have gone for alcohol was spent in supplying the homes with the necessities of life. This seems to show that a year of scarcity without alcohol is better for the people than a year of plenty with alcohol.

The jails of the country, even more than the poorhouses, are filled by the victims of alcohol. Judge Kimball, speaking before the United States Senate concerning the liquor traffic in the District of Columbia, said that he had tried 150,000 cases, and at least 75 out of every 100 of these were due to strong drink. He said: "The gentleman who was the warden of the jail for many years made it a habit to interview every new prisoner relative to the cause of his appearance there,

and the warden's estimate was that 90 per cent came there directly or indirectly through liquor."

One of the most brilliant criminal lawyers of this nation said that in 49 out of every 50 murder cases that he had had charge of "alcohol did the crime."

The Lord Mayor of London asked the matron of the Home for Women and Girls discharged from Holloway Jail, "If there were no such thing as alcohol, how many of these 735 women and girls would have been sent to prison?" She at once replied, "Only 35." In her opinion, 700 out of those 735 women would have been saved if there were no alcohol.

When the men at the Missouri Penitentiary were asked how many of them were there on account of liquor, two-thirds of their hands went up.

Which do you think would be the safest and most desirable place to live in, a city in which alcohol was freely sold in open saloons or where the sale of alcohol was forbidden?

The money that it costs to protect the public from the criminals made by alcohol, to pay the policemen, the jailers, the judges, to build and support the jails, all comes out of the people's pockets.

The insane asylum is another institution that alcohol helps to fill. Dr. Albert Ferris, who is at the head of the Commission of Lunacy for New York State, says that insanity is increasing and that this is chiefly due to the use of alcohol. About one-sixth of the total expenditure of New York

Alcohol helps to fill insane asylums.

is for its insane. Eight of the leading physicians of New York recently signed their names to the statement that fully 30 per cent of the men and 10 per cent of the women admitted to the state insane hospitals are suffering from conditions due to alcohol.

The drunkard not only injures his own brain, but he hands down his mental unbalancement to future generations. It is estimated that 50 per cent, or one-half, of defective children in the country have had alcoholic parents. A scientist who has investigated 800 cases announces that one out of every five of the children born to alcoholic parents will be insane, one out of every three will be hysterical or epileptic, and more than two-thirds will be degenerate.

When we come to the hospitals, we find the same thing as in the poorhouses, jails, and insane asylums. A large proportion of the people who are brought there are the victims of alcohol. Sir Andrew Clarke, for many years head physician in a large London hospital, said: "I am speaking solemnly and carefully in the presence of truth, and I tell you that I am considerably within the mark when I say that, going the rounds of my hospital to-day, seven out of every ten owe their ill health to alcohol."

In the hospitals are often to be found innocent persons who have been injured by the drinking habits of others. Many of the automobile and railroad accidents have been due to drinking on the part of the chauffeurs and drivers. More than 300 children were killed in

the streets of New York in one year (1911), and it was found that more than half of these accidents were due to drunken drivers or chauffeurs. The very first bill that Governor Sulzer of New York signed was one making it a penitentiary offense for a chauffeur to use alcohol.

Bad accidents caused by alcohol.

The railway companies recognize the danger to the public caused by the railroad men who drink. They began by discharging any man who became intoxicated on duty. Then they found that their men were much more reliable if they did not drink at all on duty. Recently some of the large railroad companies have adopted the rule to the effect not only that their employees must not drink on duty but that they must be teetotalers. So the railroad corporations have formed themselves into a great temperance society, for the safety of the public and for the protection of their own property. Railway accidents are a great expense to the company. A single accident has been known to cost as much as $500,000.

Before the discovery of germs, when the causes of disease were not understood as they are to-day, all that could be done was to take care of the sick. But to-day the health officials devote their efforts chiefly to the *prevention* instead of to the cure of disease. They try to destroy the germs before these germs get a chance to attack the people and cause sickness. What do you think would be the best way to deal with all the evils caused by alcohol?

The people of the state of Maine more than fifty years ago decided that the best way to solve the problem was by prohibition; that is, by forbidding the manufacture or sale of alcohol in their state. The people made this law for their own protection.

The example set by Maine has been followed by seven other states. There are now eight out of the

The fight against alcohol.

forty-nine states in which the sale of alcohol is forbidden by law: Maine, Kansas, North Dakota, Georgia, Oklahoma, Mississippi, North Carolina, and Tennessee. What have been the results in these states?

The attorney-general of Kansas, which has been a prohibition state for more than thirty years, sums up the benefits of getting rid of the liquor traffic in that state:

"With 105 counties in the state, 87 of them have no insane; 54 have no feeble-minded; 96 have no inebriates, and the few we do have come from the cities which defied the law to the very last. Thirty-eight county poor farms have no inmates. There is only one pauper to every 3000 population. In July, 1911, 53 county jails were empty, and 65 counties had no prisoners serving sentences. Some counties have not called a jury to try a criminal case in 10 years, and a grand jury is so uncommon that half our people do not know what it is."

Kansas has the largest wealth according to its population of any state in the Union. Maine has fewer

women and children working for a living than any other state. The entire eight states having state-wide prohibition have only one insane person to every 873 persons; as compared with one to every 490 in the entire nation, or about one-half as many proportionately.

In North Carolina, which has had the prohibition law for only a few years, crime has already been reduced 50 per cent. That is, there is only half as much crime there as there was before it was a prohibition state.

In Atlanta, Georgia, during 1907, which was the last year of the open saloon, there were 24,882 arrests. In 1908, the first year of prohibition, there were 16,072.

In these states the prohibition law has not as yet been made permanent by being adopted into the constitution. The question has to be voted on every few years, and at times there is great excitement and disturbance when it is feared that the liquor traffic may get started again.

In this respect the little country of Iceland has gone ahead of the United States. It is the first country in modern times to introduce national prohibition against the manufacture, importation, and sale of intoxicating drinks. Iceland is a very progressive little country. An American professor who visited it said that its people were the best-educated of any in the world. These intelligent people, in the year 1908, voted for national prohibition. In 1909 the Icelandic Parlia-

ment, in compliance with the will of the people, passed the law prohibiting the manufacture, importation, or sale of liquor.

When the king of Denmark, who is also the king of Iceland, signed this law, he said: "Few, if any, of my actions since becoming king have given me more satisfaction than I feel in signing the prohibition law for Iceland; and if the Parliament of Denmark will pass a similar law, I shall be more willing yet to approve it."

Kings and Presidents know that the progress and welfare of their people depend very largely upon physical fitness and vigor. They know that alcohol is an enemy to health, a weakener and destroyer of the race, and so they are glad to banish it from their countries.

At the International Hygiene Exhibition held at Dresden in 1911, a demonstration of the evils of alcohol was given twice a day. Statistical charts were exhibited showing the great decrease in the use of alcohol in the foremost countries of the world.

In England the use of alcohol has greatly decreased since the beginning of the twentieth century.

In Sweden, which was once called "Drunken Sweden," the progress has been very rapid, and that country is now in the forefront of the nations in the battle against the liquor traffic. In 1907 there was a great temperance gathering in Sweden, and the crown prince gave the address of welcome. As a result of the temperance reform's taking place there, that little country is becoming one of the healthiest in the world.

In Germany also the temperance reform movement is making headway. This is chiefly due to the work of German scientists and the efforts of the German Emperor. When he learned from German scientists that alcohol was injuring his people, he became a total abstainer himself and selected for his son a college in which there was the least drinking. In an address to his officers in 1911 he said: "If you educate the people to do without alcohol, I shall have sensible subjects. . . . If you promote these principles, my people will be morally elevated. That is a work in which I should like to ask you to take a share."

REMEMBER: All study and experience have gone to prove that alcohol is an unfailing enemy to health and happiness.

Health Problems

1. Have you heard people say in the community in which you live that alcohol is injuring the people? If so, state precisely in what ways it is working injury to them.

2. Do you know of any instances of men who have been sent to jail largely on account of the use of alcoholic drinks?

3. Do you know of accidents which have occurred on city streets or on railroads or elsewhere due to the use of alcohol by men in charge of automobiles, trains, elevators, or the like?

4. Do you know of any family in which there is poverty and distress because either father or mother has formed the drink habit?

5. There is probably a poorhouse in your county. If you can do so, find out the habits of the inmates in regard to the use of alcoholic drinks.

6. Take pains to find out from those who are engaged in charitable work in your community what families they have to assist and what is the chief cause of their poverty.

7. Try to find out from the physicians whether there are any feeble-minded or defective children in your community; and if there are any, try to discover whether they are the offspring of alcoholic parents.

8. Ask the chief of police in your community whether it is men who use alcohol or those who do not who give the most trouble to the police. Find out what proportion of the people who are arrested in one week use alcoholic drinks.

9. If you go to the city hall in your city, you can probably find out how much money is spent for liquor in your city or town. Try to figure out how many homes could be bought with this money. How many children could be properly clothed for one year with this money? How many boys and girls could be kept in high school for one year?

10. If you can do so, without offending any one, ask a man who is addicted to drink whether if he had his life to live over again, he would allow himself to acquire the drink habit. Ask him whether he would like to have his children form the drink habit.

11. Find out whether the people in your community have had a chance to vote on the question whether saloons should be permitted in the city. If you have saloons, and if the people have had a chance to vote on whether they should be abolished or not, try to find out why they are permitted to do business. Why do not the people get rid of them?

Review Questions

1. Tell about the journey of "Little Turtle" to Philadelphia to see President John Adams.

2. Tell about his journey to see President Jefferson and the outcome of it.

3. Tell about the journey of the great African chief to England to see Queen Victoria.

4. Why in olden times was alcohol given in moderate quantities to soldiers?

5. Why did doctors order it for their patients?

6. What has been shown during the last fifty years regarding alcohol as a food?

7. What are all civilized nations doing to reduce the use of alcohol among the people?

8. Why are all wise rulers trying to get their people to abstain from alcoholic drinks?

9. How can you tell a person who drinks whisky, beer, wine, and the like, habitually in large quantities?

10. How may even a moderate drinker suffer?

11. How does the drunkard's life bring misery upon others as well as upon himself? When the father is a drunkard, what hardships fall upon the mother?

12. What has been found out in the investigations of the reason why men do not support their families?

13. What did the distinguished Commissioner of Labor say was the cause of misery in many working families?

14. Tell the story given by a worker for the cause of temperance in which she gives her reasons for working against alcoholic drinks.

15. How much does the city of London spend each year in order to care for its drunken paupers?

16. What did Sir Victor Horsley find out about the habits of the men in the workhouse at Wandsworth, London?

17. How is food destroyed in the manufacture of alcohol?

18. What did Martin Luther say about the barley that was used for brewing in Germany?

19. What was the result, during the famine in Ireland, of closing the distilleries?

20. What has been found out regarding the drinking habits of the men who are found in the jails?

21. What proportion of the men who go to prison are sent there on account of the use of liquor?

22. What did a brilliant lawyer say was the chief cause of murders?

23. Is alcohol a cause of crime among women and girls as well as among men?

24. What did Doctor Albert Ferris say was the chief cause of insanity?

25. How does the drunkard bring misery upon future generations?

26. What did Sir Andrew Clark say was the chief cause of the diseases which he saw in the London hospitals?

27. How are innocent people often the victims of those who use alcohol?

28. Why do the railroad companies forbid their men to drink?

29. How many states have laws prohibiting the manufacture or sale of alcoholic drinks?

30. What did the attorney-general of Maine say was the result in that state of prohibiting the manufacture or sale of alcohol?

31. What has been the result in other states of suppressing alcoholic drinks?

32. What lesson can the United States learn from Iceland in regard to the use of alcohol?

33. What did the king of Denmark say when he signed the prohibition law for Iceland?

34. What progress has been made in Sweden in the control of the drink habit?

35. What did the German emperor do when he learned that alcohol was injuring his people? What did he say the people ought to do?

CHAPTER XVII

Work and Health

Every living creature works. Just notice how busily the squirrel toils in building a warm nest for its young and in gathering a winter store of food! Watch the ant as it hurries about its tasks! What wonderful tunnels it digs beneath the little mountains which it rears! The bees, the birds, and even the fishes delight in doing the work which nature gives them as a part of their lives.

A bee that does not work is called a *drone*. Do you know what the working bees do with drones when they find them in the hive? Do you think a drone lives a happy life, as does a busy working bee?

It is just so in human life. Nobody wants a lazy tramp around. He is often arrested and made to work on the road or sent on to the next town.

Occupations that are injurious.

If a man is so rich that he does not think it necessary to work, he is likely to get gout and other kinds of sickness due to his idleness. But too much work may do one harm. There are certain kinds of work or occupations that are always more or less dangerous or injurious to health and life.

Many metals are poisonous, and those who work with them are likely to be poisoned by them. Workers who silver the backs of mirrors and gild other objects are in constant danger of being poisoned by the mercury with which they work. Makers of artificial flowers run a similar risk from the arsenic used to color the paper of which they make the leaves and other green parts. Those who work with white lead, making or putting on paint, often suffer from lead poisoning. These are dangerous occupations. One who works at any of these needs to take extreme care to keep clean, especially to wash his hands often and to keep them always away from his mouth, nose, and eyes when he is at work. Those who work where there are harmful gases, or where there is much mineral dust, as in match factories, emery, copper, brass and steel works, often lose their health therefrom.

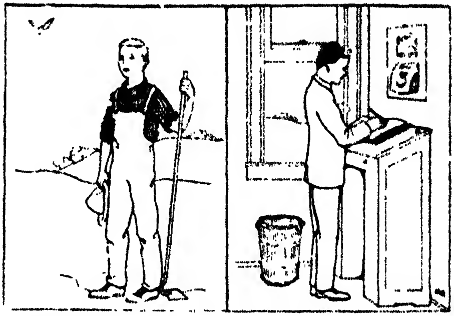
Health in outdoor work.

Do you not think the person is fortunate who can choose some clean work which takes him out of doors in the free air and sunshine? One who works in the fresh-smelling earth under the open sky, as does the gardener, the farmer, and the fruit grower, can scarcely help filling his lungs full of pure air very often each day. All the benefits to be derived from the sunshine are his, too, if he will take them. He need not depend upon unsafe, adulterated food supplies, for he can have the first pick of the products the earth yields upon his cultivation. He can secure pure water, and he can surround himself

with things clean and wholesome, if he has a mind to do so and knows how. His work and his manner of living may all tend toward health. Besides, there is the pleasure of making things grow and of doing the world a great service in helping to supply its needs.

Indoor work made healthful.

But it is not for every one to till the soil. There are other kinds of work that must be done. Some of these are out-of-door occupations. Work that is often done indoors can be taken out-of-doors to do. Can you think of various kinds of work that could as well be done out-of-doors as indoors in warm weather?



It is fine to be able to work out in the fresh, wholesome air.
But if one must work indoors he must have an abundance of light and fresh air.

The worker who must do his tasks indoors needs fresh air, too, and plenty of it. Shops, workrooms, factories, and all places in which people work ought to be well ventilated. Fresh air pays. Manufacturers who properly ventilate their mills find those who work for them do 10 per cent more than when the air is bad. Should you expect that good air would make workers feel like work and would help them to do more than when they have but little fresh air?

If you should pay a visit to a well-known manufacturing company of Dayton, Ohio, you would see its great buildings, which cover as much ground as seven city blocks, or thirty-six acres, all flooded with light and sunshine. Four-fifths of the wall space is given to windows. In order to have the light the very best, the glass is always kept clean and shining. With such an abundance of light, it would be hard for dirt to find a hiding place. It would soon be routed anyway by the small army of service men, whose part it is to keep things clean and sanitary. A huge ventilating plant draws in a constant stream of fresh outdoor air and at the same time it forces out the dusty indoor atmosphere. Even from the rooms where the metal is polished, great suction fans draw off the mineral dust so the workmen need not breathe it. With such provisions for light, air, and cleanliness, the workers here fare about as well as if they were actually working out-of-doors.

The water is supplied from sanitary fountains. It might surprise you to find here beside the work shops some nice bath rooms, rest rooms with comfortable chairs and lounges, a recreation room, a library, and lunch rooms where clean, wholesome food may be had at a fair price. Here everything is arranged for the comfort and welfare of the workers. You would like especially the playgrounds, where outdoor sports of all kinds fill in the noon hour. There are pleasant walks, too, and lawns and flowers. Then there are the "boys' gardens," where in vacations the boys of

the neighborhood vie with each other in making things grow.

Special care is taken at this factory to provide against accidents; but if a worker does get hurt or becomes ill at work, a physician and nurse in the "emergency hospital" give him good care. There are classes in physical culture and in the laws of health for the workers to attend. No effort is spared to promote the welfare of each person employed. You may think it does not require all these advantages in order to make cash registers. Probably not; but since these things help make the workers able to do their very best, and do it for more years, do you not think they are well worth while? Besides, it is only just to treat the workers in this manner. Do you not think every human being has the right to keep his health wherever he works? It would be better for every one if all persons who employ help would remember this.

Conditions that are not healthful.

Unfortunately, there are a great many working places in which the only aim is to get the work done with the least cost in money. In some of these places so large a number of people work and the ventilation is so bad that the air is unfit to breathe. Oftentimes, too, the material upon which the people are at work gives off much dust, and they cannot help breathing it. Thus, they are very liable to get some disease of the lungs. If there be a lack of light and cleanliness, this adds

to the danger. In some places, too, there is constant danger of injury to life and limbs from saws and belts. Much of this might be avoided by the use of safety devices. A count was made a few years ago which showed that the number of those who lose their lives because of the bad conditions under which they work is about equal to one out of every four workers.

To lessen this great evil, some states have made laws to regulate the health conditions of working places. Inspectors make regular visits to all factories and shops and stores, to observe if the buildings are sanitary and if care is taken for the safety of those employed. This helps a good deal; but to make conditions just as good as they ought to be, there would often be required new buildings purposely arranged for health and comfort and safety.

The health of those who work depends, also, upon the work period. Too many hours without stopping tires the body and does not give time enough for rest and recreation. Where the work is the kind that demands great effort, or one where the worker is in danger from harmful substances, short shifts and few hours should be the rule.

Have you noticed that one can endure working for a longer period at something that affords variety of movement, as do housework and carpentry, than he can at such a task as filling boxes in a factory? Can you tell why?

Here is an interesting fact that will illustrate the

point. A great many roads lead into the city of London. It has been observed that on one of these roads more of the horses that travel it give out than upon any other road. Inquiry as to the reason for this showed the road was so level that a horse going over it used only one set of muscles; whereas, if the road had been uneven, a greater variety of muscles would have been used, and no one set would have been overworked.

Child labor in mines and factories.

Doubtless you know that in some industries many child laborers are employed. In the year 1911, two million children in the United States, some of them no older than yourselves, were at work in cotton and woolen mills, glass factories, coal mines, canneries, and such places. Every morning at 6.30 o'clock or earlier, these child laborers must be up and off to their working places, there to labor until dusk, with perhaps only a half hour at noon for rest and luncheon. Few of these child workers have any chance to get an education. Out of forty-one boys examined in one South Carolina mill, twenty-eight could neither read nor write. For them it is "all work and no play," which you have heard "makes Jack a dull boy." It not only makes a child dull, but it stunts and deforms his body.

In the coal mines of Pennsylvania, the "breaker boys," of which there are hundreds, sit crouched hour after hour over the long chutes, picking out the slate from the coal as it runs past. All the time they are

in a cloud of coal dust which they must breathe. Their constant cramped posture soon makes them bent-backed like old men.

A gentleman (Mr. John Spargo) who went down into one of the mines to investigate the working conditions of these boys said: "I stood in a breaker for half an hour, and tried to do the work that a twelve-year-old boy was doing day after day for ten hours at a stretch, for sixty cents a day. Outside, the sun shone brightly and the birds sang in chorus with the trees and the rivers. Within the breaker there was blackness, clouds of deadly dust over everything; the harsh grinding roar of the machinery and the ceaseless rushing of the coal through the chutes filled my ears. I tried to pick out the pieces of slate from the hurrying streams of coal, often missing them, and my hands were bruised and cut in a few minutes. I was covered from head to foot with coal dust, and for hours afterwards was expectorating some of the small particles I had swallowed."

A visitor to a glass factory at night saw little boys, several of whom were less than twelve years old, carrying loads of red hot bottles on asbestos shovels from one place to another. Each trip they walked one hundred feet. Seventy-two trips were made each hour, so that at the close of their eight hours' work each had traveled about twenty-two miles. Over one-half that distance they had carried their hot loads. Do you know why night work of this sort is most

harmful to the young? As a rule, the boys do not get proper rest by day; and this, with the heat and glare in which they work, soon ruins their health.

The little workers who strip tobacco leaves, who pack matches in boxes, who work in color rooms among poisonous dyestuffs, who work in soap factories, in rubber factories, and type foundries are all in dangerous employments. Why? What do you think people should do about such a matter as this?

REMEMBER: While all people need to work, there are some kinds of work which are more healthful than others; and all work which can be done outdoors should be done there. All kinds of work should be made as safe and healthful for the workers as possible.

HEALTH PROBLEMS

1. Do all creatures need to work? Would it be better, do you think, if human beings did not need to work? Why?

2. Make a list of all the kinds of workers in the community in which you live, and be ready to tell whether you think each kind of work is healthful.

3. What kinds of work in the community in which you live seem to be especially healthful? Why?

4. What kinds of work in your community are unhealthful? Why?

5. Can you suggest any way to make the kinds of work that are unhealthful safer for those who do the work?

6. Do you know whether there are any laws in your community which aim to make any kinds of work safer for the workers?

7. Do you think the people who till the soil are more healthy than people who do other kinds of work? Have you known

farmers to do things which injure health? If so, mention these things.

8. What kinds of work do you know that are done indoors which could be done outdoors just as well?

9. Do you know of any manufacturing establishment in your community which has as much light and air as is desirable? If so, describe it.

10. Make a visit to some of the manufacturing plants in your community, and describe the conditions as to light and air and safety for the workers. Be careful to be accurate in what you say.

11. Are there any laws in your community which make manufacturers look after the safety of their workers? Describe such laws.

12. What sort of manufacturing in your community employs young children? At what age do they begin work? How many hours do they work each day?

13. Are there any laws in your state which forbid manufacturers to employ children under fourteen or fifteen years of age? If there are no such laws, do you think that some should be passed? Why?

Review Questions

1. How do the squirrel, the bee, and the bird work? What is a bee called that will not work?

2. What do the working bees do to a *drone?*

3. Mention some kinds of work that are injurious to health.

4. What kind of work is most healthful?

5. What does one who tills the soil have which those who work in shops and factories often cannot get?

6. Does one who works indoors need to have plenty of light and air? Why?

7. What disease is one likely to get who works where there is dust?

8. What kinds of dust are especially harmful?

9. How do some of the states try to secure good light, air, and so on, in all factories, shops, and stores?

10. What kinds of work will tire the worker most quickly?

11. In what kinds of work are children employed?

12. What happens to the education of young children who have to work in cotton and woolen mills, glass factories, and so on?

13. Describe the work of the "breaker" boys in the coal mines of Pennsylvania.

14. What did the visitor find who visited the glass factory to see what work the boys had to do?

CHAPTER XVIII

Common Accidents

All persons are liable to meet with accidents. To know what to do and how to do it, when an accident occurs, may often save a person's life. In most cases, the need for prompt action is so great that it is best for one to apply his own knowledge first, if no other aid is near, provided he knows the right thing to do, and then call an older person, especially a doctor.

How to make a wound stop bleeding.

Last summer, while a crowd of boys were playing together in a field, one of them ran against a scythe, which had fallen from the limb of a tree where it had been hung; and it cut a long, deep gash in his leg. The wound bled very fast. As the boy was quite a distance from home, he was in danger of bleeding to death. One of his companions, a lad of fourteen, pulled out his handkerchief, folded it crosswise, and tied a knot in the middle. He put into the knot a small pebble. Then he bound it as tightly around the leg as he could so that the knot came just *above the cut* but not *over* it. After tying the handkerchief, he passed a lead pencil underneath on the opposite side of the first

knot and twisted it round and round to make it tighter. This soon checked the bleeding. Can you tell why?

Some of the boys then made a "chair" with their hands, and carried their companion to the nearest

HOW TO STOP BLEEDING FROM AN ARTERY. WHY IS THE KNOT PLACED *above* THE CUT?

house. Then a surgeon was called to mend the cut blood vessel. For a while, the *tourniquet*, as it is called, made with the handkerchief, had stopped the bleeding. But it would not be safe to leave anything so tight on his leg for a long period, not over an hour at the most. Why?

A short time after this incident, one of a group of schoolboys, in a scramble to be first to get a ball with which they were having a game on the school grounds, cut his arm quite badly on a fence barb. The blood flowed from the wound in a stream. A playmate who

TO STOP BLEEDING FROM A VEIN. WHY IS THE KNOT TIED *below* THE CUT?

had seen the treatment given to the boy who had cut his leg tried to stop the bleeding in the same way, but without success.

"Tie a handkerchief both *above* and *below* the cut," advised their teacher, who came out to see what was the matter.

This was done and the bleeding stopped.

"But I'm sure that's not the way it was done the other time," said the boy.

"True," replied his teacher, "but then an *artery* had been cut. This time it is a *vein*."

"Well! how is one going to tell which is which?" queried the boy.

"By just this," said his teacher. "The blood from an *artery is bright red, and comes in spurts with each heart beat.* The blood from a *vein* is of a *darker color, and flows in a steady stream.*"

In the first case, if nothing with which to make a bandage had been at hand, the bleeding might have been checked by placing both thumbs directly opposite each other *just above the cut, between it and the heart,* as in the picture, and *pressing hard.* The pressure must always be kept up until a surgeon arrives to give the injury attention.

A small wound usually cuts only a *capillary* vessel. (What is the meaning of capillary?) You can tell this because the blood merely oozes from it. A good way to stop its bleeding is to keep the cut part in a basin of water as hot as can be borne for at least ten minutes. Ice water, too, will stop the flow of blood, but ordinary cold or warm water will not suffice. Of course, all wounds, even the smallest, need to be cleansed before being dressed. So it is a wise plan to dissolve enough green soap in hot water to make good suds. Then when the bleeding has stopped, wipe the cut part well with a clean towel, draw the edges of the cut

together, and fix them in place with a piece of adhesive strap. When a cut has been made with something having a ragged edge, as broken glass or nails, there is need of greater skill in treating it, and it is wisest to have the wound attended to by a trained nurse or surgeon.

Nosebleed may generally be stopped by holding the head erect, reaching both hands high above it and, at

ONE WAY TO STOP NOSEBLEED.

ANOTHER WAY TO STOP IT.

the same time, taking several deep breaths. Put a basin under the chin to receive the blood, or press the corner of a dry handkerchief into the bleeding nostril. Snuffing ice water up the nostril and holding ice to the bridge of the nose will also help. If the bleeding is very bad or is not readily stopped, a physician should be called.

Two sisters were standing near an open fire early one Christmas morning, taking the gifts from their stockings. Suddenly the dress of the younger one caught fire. Before even the girls were aware of it, the flames shot above the child's head.

How to treat burns.

"Lie down on the floor! Lie down quick Nettie!" urged the older girl, who remembered that flames always rise upward, and who knew that if Nettie remained standing the flames would have a good chance at her hair and face. While Nettie, who was terribly frightened, hesitated what to do, her sister threw her to the floor and, grabbing an Indian blanket from the couch, drew it close about her neck, afterward wrapping it tightly around her, from head to foot. Then she lifted a corner of the floor rug and, rolling Nettie over and over, wound that snugly about her. So promptly did she act that before their parents reached the scene, the fire had been smothered. Nettie was unharmed, save for the singeing of her hair and a few slight burns. The brave little rescuer had really suffered the greater harm. In the excitement of the moment, she had not thought of herself. When, however, the danger was past, she realized that her hands had been burned in several places. As the skin was still whole, her mother wet pads of cotton in *picric acid* solution and bound them over the burned places to quiet the pain. If she had not had picric acid, she would have put a heaping teaspoonful of baking soda in a pint of tepid

water for the little girl to keep her hands in. It would have been just as well to put soft cloths, doubled several thicknesses and wet in the soda water, on the burns. Tepid water alone, without any soda, will ease the smarting from a burn; but contact with the air always increases the pain.

If the skin had been destroyed, something that would have covered the entire surface and protected it from the air, would have been needed. White vaseline is good for this purpose. A thick coating of dry baking powder with soft cotton above it, or even fine flour used in the same way, is useful.

Fourth of July accidents.

Some people think of the Fourth of July as a day of good times and festivities. Yet it is a sad fact that more boys and girls are killed or maimed for life on that day than on any other during the entire year. In 1910, over five thousand individuals in the United States, many of them children, met with Fourth of July accidents resulting in a loss of life, or injury to some part of their bodies. Just think of thousands of persons, more people than are wounded in most battles, each losing an eye, a thumb, a hand, an arm, a leg, or even life, on a celebration day! Do you not think there ought to be some better way for celebrating our nation's liberty? In some cities and towns, the authorities have already forbidden the sale of giant crackers, toy cannons, and similar articles. Is this wise?

Things which explode tear the flesh into ragged

wounds, even if they do not sever some member from the body. Of course, from such a wound the blood will flow freely, and it is most important to remember just how to stop it. A short general rule which it will be well for you to learn by heart is: Raise the in-

FOURTH OF JULY ACCIDENTS ARE LIKELY TO BE VERY SERIOUS.

jured part as high as possible, and apply pressure. You see one has to think quickly when an accident occurs. If you have said the rule over until you know it as you do the multiplication table, you will be quite likely to remember it when you need it.

You should remember, too, that when the wounded vessel is an *artery*, the pressure should be applied

between the wound and the heart. In a *vein* apply the pressure *on both sides.* Why?

Just as soon as the bleeding stops, the wound should be well cleansed. No one should do this, however, with dirty hands. A surgeon or a nurse is the best person to attend to it; but when neither can be had, some person who has thoroughly cleansed his own hands and nails, and afterward disinfected them by dipping them in *tincture of iodine*, should cleanse the wound. First wash it with pure soap and water that has been boiled. Then apply *tincture of iodine.* Why do you think it necessary to use boiled water?

One needs to be sure that no shreds of cloth, fragments of soiled clothing, or dirt of any other sort is left in the wound. Why? After cleansing a wound, it must be protected from the air and dust and germs by some suitable dressing, while nature goes to work to repair the damage.

The dreadful disease called *tetanus* or *lockjaw* often follows Fourth of July injuries. Bacteria very commonly found in dirt are the cause of it. These may be carried into the wound on bits of soiled clothing or other dirty material. This is likely to occur to jagged wounds made by gunpowder on the hands or feet. Now you can see why it is so necessary to cleanse a wound with special care. Other bacteria, too, beside the tetanus germ are likely to make their way into the blood through any broken place in the skin.

Lockjaw may result, also, from the skin's being broken by stepping on a rusty nail, or a dirty piece of broken glass. Fortunately, there has been discovered for this dreadful disease an *antitoxin* which, if given in time, will prevent it. It is best to run no risks. When a wound occurs from anything likely to convey the germ, a physician should be called to give antitoxin.

ONE SHOULD DISINFECT A NEEDLE OR OTHER INSTRUMENT IN A FLAME BEFORE INSERTING IT IN THE SKIN TO REMOVE A SPLINTER.

To remove a splinter.

Every person knows how annoying a splinter or a thorn in the flesh is. Even a very little thing like this may cause considerable suffering if not promptly gotten out. The best way to remove a splinter is to pull it out with a pair of small pliers or tweezers. To dig it out with a pin or needle may tear the flesh. When there is nothing else at hand, a needle may be used. But first hold it for a moment in the flame of a candle or of a burning match to make it *sterile* (clean from germs).

Even so small a wound needs to be cleansed in soap

and water, then painted with tincture of iodine, and protected by a dressing from the dirt and germs. We cannot be too particular with hurts upon the hands, and the feet, too, if one goes barefoot. These members come so often in contact with dirt and dirty things that when the skin, the covering which protects the flesh, is broken any sort of germ may get in.

The treatment of a person who has fainted.

Let us look now at another kind of accident. Several girls were recently chatting together in an overwarm room; one of them fainted. Her frightened comrades laid her upon a lounge, piling the pillows high under her head.

"Oh, not that way!" cried one of the group, coming forward; "open the windows and give her air. Take out the pillows and help me to put some books under the foot of the lounge to make that end higher. Wet her face and neck with cold water. We must loosen her clothing, too," she added, as she began to unfasten her collar and waist. With this treatment, the color came back to the girl's face very shortly; and in a few minutes she had quite recovered.

"Why did you lower her head?" questioned someone.

"Because," replied the girl, "when a person faints, a large share of the blood has left the brain, and we want to do everything we can to invite it back again. Unfastening the clothing helps, too; and besides, it makes it easier for the person to breathe. When a person feels very faint the best thing for him to do is

to sit in a chair and bend forward, bringing the head as low as possible. If it had been sunstroke, though, the right thing to have done would have been to raise the head as high as possible, because in that case there is too much blood in the head."

REVIVING THE FAINTING GIRL.

"But how may one know them apart?" was asked.

"Why, a person who has fainted is very pale, while a person with too much blood in the head has a flushed face," was the response.

For sunstroke, which is a very serious thing, a doctor should be called at once. Waiting for him, one can

help by putting an ice bag on the victim's head, and bathing the face and chest with cold water.

When something lodges in the throat, eye, or nose.

Here is another accident: a creeping baby swallowed a button which lodged in his throat. His mother, frightened by his choking, was unable to do anything for his relief. A guest who was calling at the time quickly suspended the child by his feet, gave him a vigorous shake, with also a slap on the back, and the button flew out of his mouth.

When anything sharp like a fishbone becomes lodged in the throat, more skillful measures are required, and surgical help should be called without delay. When anything pointed, jagged, or sharp, as a pin, a needle, or a fish hook is swallowed, the wise thing for a person to do is to eat a full bowl of corn-meal mush *without milk* or a large quantity of mashed potato or soft bread in order to force the object along the food tube. A far wiser thing is to avoid danger by not putting such things in the mouth.

If you should ever have the misfortune to get sand or dirt in your eye, remember not to rub it. Often the tears will wash out the dirt. Sometimes closing the eyes tightly and blowing the nose hard are sufficient. Drawing the upper lid away from the eye and gently stroking it in a downward direction is another good thing to do. If none of these methods succeeds, some one who understands how to do it should be

called upon to remove the sand or cinder with the twisted corner of a handkerchief. Particles which

How to get a cinder out of the eye.

have become stuck in the eye must have the attention of a physician, of course.

Small objects in the nose, if not crowded up too far,

may generally be removed by putting a finger upon the other nostril so as to close it, keeping the mouth shut meanwhile, and blowing the nose hard.

Bruises.

A bruise, caused by a blow received upon any of the soft parts of the body, a stubbed toe, or a jammed finger are best relieved by a hot *fomentation* applied to the injured part. A *fomentation* consists in applying cloths wrung out of very hot water. Flannel cloths are best for this purpose. Pieces of an old flannel undergarment, two or three wool stockings, or a piece of an old shawl may be used, if soft flannel cloth or a wool blanket are not convenient.

Have the water near the boiling point. The cloth should be somewhat larger than the part to be treated. Fold the cloth so as to get the right width, but about twice the needed length. Grasp it by the ends, and dip the center in the hot water. By twisting the ends as you see in the picture, the hot water can be squeezed out without touching it with the hands. A dry flannel cloth should be laid next the skin, the hot wet cloth should be laid above that, and the whole should be covered with another dry flannel cloth. As soon as the wet cloth begins to feel at all cool, it must be reheated in the hot water. Repeat this for fifteen minutes. Then remove the hot cloths and, for the finish, apply one wet in ice or very cold water. Why? Carefully dry the parts afterward. For toothache and the like this treatment will generally afford relief.

For bites and stings from common insects, the best thing to do is to bathe the parts in salt and water or strong soda water. When a sting is left in the wound, it should be withdrawn. Why?

Bites and stings.

One August day, not long ago, several boys, who belonged to a "Boy Scout" company, were picking berries in a huckleberry swamp, when one of the number, who was barefoot, was bitten by a rattlesnake. Telling some one else to run for aid, the oldest lad in the group picked the boy up in his arms, carried him a short distance to a safe spot on drier ground; and pulling off his necktie, he bound it tightly about the wounded leg between the bite and the heart. Breaking a short twig from a tree, he fixed a *tourniquet* and twisted it until the necktie was tight enough to shut off the circulation. With his pocket knife, he made two quick cuts, crossing each other in the flesh over the wound, and going in just a little deeper than the snake's fangs had gone. Then squeezing the wound to make the blood flow, he put his lips to it, and sucked it vigorously, spitting out the poisoned blood as it came. Why did he do this unusual thing?

You will be interested to learn that it saved the boy who was bitten. Of course, no one with sores on his lips could with safety do such a thing. Why? It would do no good, either, to suck the wound made by the fangs of the snake without making the wound bigger, because the fangs do not leave an opening in the flesh any larger than would a fine-pointed needle,

which is altogether too small for the poison to be drawn back through.

It was most fortunate for the boy that he kept perfectly still after he was bitten. If he had got excited and run home, as boys are likely to do at such times, his blood would have flowed more rapidly, and then it would have more quickly carried the poison throughout his whole body. I suppose you know that the venom of a snake is very poisonous. To keep it from circulating in the body is the one thing to do when a person is bitten. What did the Boy Scout leader do to prevent this? Could you have done anything else?

When pure water can be had, it is well to bathe the wound thoroughly with it. Some crystals of *permanganate of potash* dissolved in the water until it becomes a deep wine color will make it still better for bathing the wound. Indeed, it is best to rub these crystals right into the wound as quickly as possible, and to keep it covered with a pad wet with water in which some of them have been dissolved.

It used to be believed that a dose of whiskey should be given to cure a snake bite. A few years ago, a physician (Dr. Ellis Allen) proved by a series of experiments, in which small animals were given the snake poison of the copperhead moccasin, that whiskey has no value whatever as a cure. Rats given the whiskey died earlier than did the same-sized rats without it, although they were all given the same dose of poison.

You will remember that we learned in Book I that the white cells are the defenders of the body against germs and poisons that get into the blood. We learned, too, that alcohol in any form hinders their work. When a person has ever so small an amount of alcohol in his blood, it holds back these little white cell policemen, thus leaving the way open for the poison to do its deadly work.

Various *antidotes* for different kinds of snake bites are now prepared and may be given by a physician. It is well-nigh impossible for snakes to drive their fangs through rubber, so that it is a good plan to wear rubber boots when one must walk or work in places which snakes frequent. In addition, one should always carry at such times a dram or two of permanganate of potash crystals ready for use.

REMEMBER: To know what to do in case of an accident is very important; but it is even more important to prevent accidents by using knives and all other sharp instruments, firearms, and all explosives in a cautious manner. To pour kerosene on a fire, to fill a kerosene lamp or a gasoline stove while either is burning, to take a lamp or candle into a room where gasoline is being used for cleaning or where a gas pipe is leaking, is to invite acidents. But one ought occasionally to imagine that an accident has occurred, and then to see how quickly and effectively he can treat it. In this way he may be ready when a real accident does occur to treat it properly.

Health Problems

1. What accidents are likely to happen to young people on the street?

2. What accidents are likely to happen to older people on the street any day?

3. What accidents frequently happen that would be helped by immediate care if one knew how to treat them?

4. In bleeding accidents, should the treatment be applied *always* between the cut and the heart? Why?

5. In most of the bleeding accidents you observe, does the blood flow from the artery or from a vein? How can you tell?

6. Have you ever had an accident to the skin which left a *festering* sore? Why should this have happened? Could it have been prevented?

7. There is an old saying that if you ever wish to pick a boil with a needle, you must first heat the needle white-hot in a flame, and then let it cool. Is this good advice? Why?

8. In wiping off blood from a cut, is it right first to moisten the cloth in the mouth?

9. Do you think there ought to be a law against the use of giant firecrackers and the like in every city of the country? Is there such a law in your community?

Review Questions

1. What is a *tourniquet?* How is it used?

2. What is the color of blood that flows from an artery? From a vein?

3. Where should pressure be applied in order to stop bleeding when an artery is injured?

4. Where should the pressure be applied when a vein is injured?

5. What is a good way to stop bleeding when a cut is not very severe?

6. How should a wound be treated when it is made with broken glass? With a nail?

7. What is a good way to stop nosebleed?

8. What should be done when the skin is burned?

9. What accidents are likely to happen from the use of giant crackers, toy cannons, and similar articles?

10. What should be done to a wound as soon as the bleeding stops?

11. How should one disinfect his hands if he is going to touch a wound? Why is this necessary?

12. What is the disease called *lockjaw?* How is it caused?

13. What has been discovered that helps to cure lockjaw?

14. How should a splinter or thorn be removed from the flesh? Would it be well to dig it out with the point of a needle?

15. Why must great care be taken with cuts or bruises on the feet?

16. What should be done when a person faints? How can you tell when a person has fainted?

17. What should be done when one suffers from sunstroke?

18. How should one get sand or dust out of the eye?

19. How should small objects be removed from the nostrils?

20. What is a *fomentation?*

21. How can fomentations be used to help people when they have had an accident?

22. How would you treat bites and stings of insects?

23. What should be done for one who has been bitten on the foot by a snake?

24. Is it well for one when he has had an accident to take alcohol?

25. What is the name of the remedies which are used for snake bites? What is the meaning of this name?

GLOSSARY

KEY TO PRONUNCIATION

ā, as in **āle**; **ȧ**, as in **sen'ȧte**; **â**, as in **câre**; **ă**, as in **ăm**; **ä**, as in **ärm**; **ȧ**, as in **ȧsk**; *a*, as in fi'n*a*l; **ē**, as in **ēve**; **ė**, as in **ė-vent'**; **ĕ**, as in **ĕnd**; **ẽ**, as in **fẽrn**; *e*, as in re'c*e*nt; **ī**, as in **īce**; **i̇**, as in **i̇-de'a**; **ĭ**, as in **ĭll**; **ō**, as in **ōld**; **ȯ**, as in **ȯ-bey'**; **ô**, as in **ôrb**; **ŏ**, as in **ŏdd**; **ū**, as in **ūse**; **u̇**, as in **u̇-nite'**; **ŭ**, as in **ŭp**; **û**, as in **ûrn**; **ȳ**, as in **pĭt'ȳ**; **o͞o**, as in **fo͞od**; **o͝o**, as in **fo͝ot**; **ou**, as in **out**; **oi**, as in **oil.**

A

accident (ăk'sĭ-d*e*nt). An unexpected event of an unfortunate nature.

adhesive (ăd-hē'sĭv). Sticky, clinging.

adulteration (ȧ-dŭl'tẽr-a'shŭn). Making a food, drink, etc., impure by putting a foreign substance into it.

Anopheles (ȧn-ŏf'ĕ-lez). The name given to the mosquito that carries malaria germs.

antitoxin (ăn'tĭ-tŏks'ĭn). A substance that destroys the poisonous effects of germ diseases.

antivivene (ăn'tĭ-vē'nin). An antitoxin or remedy for snake poison.

aqueduct (ăk'wė-dukt). A channel dug through the earth for carrying water.

arsenic (är'sė-nĭk). A poisonous substance which in its natural state resembles metal but is not a metal. It is a poison.

artery (är'tẽr-ȳ). A blood vessel which carries the blood from the heart to the lungs and tissues.

artesian well (är-tē'zh*a*n). A well made by boring into the earth till the drill reaches water, which then flows of its own accord like a fountain.

artificial (är'tĭ-fĭsh'*a*l). Not natural; made by human skill and labor.

asbestos (ăs-bĕs'tŏs). A substance that will not burn, and that is used to protect things from fire.

atom (ăt'ŭm). The smallest particle of matter.

B

bacteria (băk-tē'rĭ-ȧ). Vegetable organisms too small to be seen by the naked eye. Certain kinds are harmful to the body; other kinds are helpful.

bloated (blōt'ed). Swollen; puffed out.
boracic acid (bȯ-răs'ĭk). An acid made from borax, and used to destroy germs.
bubonic plague (bū-bŏn'ĭk plāg). A deadly contagious fever that causes swelling of the glands.

C

capillary (kăp'ĭl-lā-rȳ). A tiny thin-walled tube that connects a vein with an artery.
carbolic acid (kär-bŏl'ĭk). A poisonous acid derived from coal tar and other sources. It is a strong germ destroyer.
carbon dioxide (kär'bŏn dī-ŏks'ĭd or īd). A gas formed in the lungs when one breathes.
catarrh (kȧ-tär'). "Cold in the head," or inflammation of the mucous membrane in which there is an increase in the amount of mucus secreted; especially applied to the nose.
certified (sẽr'tĭ-fīd). Guaranteed to be pure, applied to milk mainly.
cesspool (sĕs'po͞ol'). A sort of cistern for filth; made usually at the end of a drain.
chloride (klō'rīd). A compound of chlorine with one other element. Chlorine is a greenish yellow gas, evil smelling and poisonous. A strong germ destroyer.
cholera infantum (kŏl'ẽr-ȧ ĭn-făn'tŭm). A dangerous summer disease of infants caused by hot weather, bad air, or poor milk.
community (kŏm-mū'nĭ-tȳ). A body of people living in the same place under the same laws.
congested (kŏn-jĕst'ĕd). Swollen, caused by the blood gathering in an unusual quantity in any part of the body.
contaminated (kŏn-tăm'ĭ-nā'tĕd). Tainted, polluted, spoiled.
Culex (qū'lĕks). The name given to the kind of mosquito that does not carry germs.
culture plate (kŭl'tûr). The plate on which is placed a fluid in which germs are made to develop.

D

decay (dē-kā'). To waste away; to rot; to perish.
decompose (dē'kŏm-pōz'). To rot; to decay.
defile (dē-fīl'). To make foul or impure.
degenerate (dē-jĕn'ẽr-āt). Having lost in strength or power of body or mind; degraded, base, low.

diphtheria (dĭf-thē'rĭ-ȧ). A very dangerous contagious disease in which the air passages, especially the throat, become coated with a false membrane.

disease (dĕz-ēz'). Illness; disorder; sickness.

disinfect (dĭs-ĭn-fĕkt'). To free from disease germs; to purify.

distill (dĭs-tĭl'). To vaporize; to condense; to purify water especially by taking off the pure water as steam and leaving the impurities behind.

duct (dŭkt). A tube or canal through which any fluid is carried.

dysentery (dĭs'ĕn-tĕr-ȳ). A serious disease occurring usually in summer.

E

environment (ĕn-vī'rŭn-mĕnt). Surrounding conditions, influences, or forces, by which living forms are influenced and modified in their growth and development.

epidemic (ĕp'ĭ-dĕm'ĭk). A disease which affects many people at the same time, and which spreads widely.

epileptic (ĕp'ĭ-lĕp'tĭk). A person who is afflicted with the disease that causes him to fall suddenly unconscious and to have convulsions of the muscles.

ether (ē'thĕr). Refined air; an element like air but thinner.

F

filth (fĭlth). Foul matter; anything that soils or defiles; dirt.

filtration (fĭl-trā'shŭn). The process of separating a liquid from the undissolved particles floating in it.

fomentation (fō'men-tā'shŭn). The application of warm, soft, medicinal substances for the purpose of relieving pain.

formaldehyde (fôr-măl'dė-hīd). A disinfectant, used to kill the germs of fevers especially.

fume (fūm). Smoke; vapor.

G

garbage (gär'bȧj). Refuse from the kitchen.

gelatin (jĕl'ȧ-tĭn). Animal jelly obtained from animal tissues by prolonged boiling. This substance dissolves in hot water and forms a jelly on cooling.

germicide (jĕr'mi-sid). Destructive to germs.

glucose (glū'kōs'). A kind of sugar found in ripe grapes, etc.

grippe (grip). The influenza, or severe "cold in the head."

H

hookworm (hŏŏk′wûrm). A tiny animal that gets into the blood through the skin and makes its way to the bowels and sucks the blood of its victim.

hydrant (hī′drant). A device with a valve and spout at which water may be drawn from the mains of waterworks.

hysterical (hĭs-tĕr′ĭ-kăl). An intensely nervous state in which a person loses control of his nerves, and laughs and cries in an uncontrolled way.

I

impurity (ĭm-pū′ri-tў). Foulness; adulteration; a state of being unfit to use.

inorganic (ĭn′ôr-găn′ĭk). Without life; inanimate, as a stone, etc.

intestines (ĭn-tĕs′tĭnz). The bowels.

iodine (ī′ô-dīn or dēn). Often used as a germicide or germ destroyer.

L

larva (lär′vȧ). Any young insect from the time it hatches from the egg until it becomes a pupa or chrysalis.

M

maggot (măg′ŭt). The footless young or larva of any fly.

malady (măl′ȧ-dў). Any disease of the human body; especially a lingering or deep-seated disease.

malaria (mȧ-lā′ri-ȧ). A fever caused by the bite of a certain mosquito.

membrane (mĕm′brān). A thin layer or fold of tissue serving to cover or line some part or organ, and often secreting or absorbing certain fluids.

menace (mĕn′ās). An evil or catastrophe likely to happen unless it is guarded against.

microbe (mī′krōb). An animal body so small that it cannot be seen by the eye unaided.

micro-organism (mī′krō-ôr′gan-iz′m). A very small living thing which can be seen only by the aid of a microscope.

microscope (mī′krô-skōp). An instrument for enlarging an object that is too small to be seen by the naked eye.

O

opium (ō′pĭ-ŭm). A drug made from poppy juice; it is usually smoked like tobacco.

organic (ôr-găn'ĭk). Living, as a plant or animal.
oxygen (oks'ĭ-jĕn). The element in the air we breathe that gives energy and burns up refuse.

P

parasite (păr'á-sīt). A plant or animal obtaining nourishment immediately from other plants or animals to which it attaches itself.
Paris green (păr'ĭs grēn). A poisonous green powder used chiefly to kill insects.
particle (pär'tĭ-k'l). A minute part of matter, an atom.
pasteurization (păs-tẽr'ĭ-zā'shŭn). A process devised by Pasteur for killing germs and so preventing or checking fermentation in milk especially.
permanent (pẽr'mȧ-nent). Durable; fixed; lasting, not changeable.
permanganate (pẽr-măn'gȧ-nāt). A salt derived from manganese.
petroleum (pē-trō'lē-ŭm). A mineral oil, or natural oil.
photometer (fō-tŏm'ē-tẽr). An instrument for measuring the amount of light in a place.
picric acid (pĭ'krĭk). An intensely bitter acid.
plague (plāg). A pestilence; a disease which kills many people at one time.
pneumonia (nū-mō'nĭ-ȧ). A disease of the lungs.
pollute (pŏ-lūt'). To make foul; to taint; to spoil.
porous (pōr'ŭs). Full of minute openings or passageways.
premises (prĕm'ĭ sez). A piece of real estate; a building and its adjoining grounds.
preservative (prē-zẽrv'ȧ-tĭv). That which has the power or quality to keep a thing from decaying.
prohibition (prō'hĭ-bĭsh'ŭn). The act of forbidding by authority.
ptomaine (tō'mȧ-ĭn). Poison which has its origin in dead matter.
pupa (pū'pȧ). Any insect in that stage of its change just before the adult stage.

R

recreation (rĕk'rē-ā'shŭn). Refreshing oneself after toil by means of rest or pleasure.
refuse (rĕf'ūs). Waste. Matter that is useless or worthless.

S

salicylic acid (săl'ĭ-sĭl'ĭk). Used sometimes as a remedy in rheumatism.
saliva (sȧ-lī'vȧ). The fluid that is found in the mouth and that is needed to digest starchy foods.

sallow (săl'lō). Having a yellowish color; of a pale, sickly color, tinged with yellow.

sal soda (săl' sō'dȧ). A substance used in making soap, glass, paper. Called also *washing soda* or *soda*.

sanitation (săn'ĭ-tā'shŭn). Making clean or pure so as to secure or preserve health.

sash (săsh). The framing in which the panes of glass are set in a window, including the narrow bars between the frames; used for the entire half of a window, as, *upper sash*, *lower sash*.

scarlet fever (skär'lĕt). A contagious fever in which the patient has a rash of red on his body that causes the skin to peel about the seventh day after the rash appears.

scavenger (skăv'ĕn-jẽr). A person whose business is to clean the streets; any animal which eats refuse or anything injurious to health.

sediment (sĕd'ĭ-ment). The matter which drops to the bottom from water or any other fluid.

sewage (sū'āj). The contents of a sewer or drain; refuse matter carried off by sewers.

shellac (shĕl'lăk'). A substance produced mainly on the banyan tree, and used to coat candy sometimes, though its proper use is on furniture, etc.

solution (sȯ-lū'shŭn). The act or process by which the parts of any body are made into a liquid from a solid.

stagnant (stăg'nant). Not flowing; motionless, usually slimy and bad.

Stegomyia (stĕg-ō-mī'ȧ). The name given to the kind of mosquito that carries the yellow fever germ.

sterile (stĕr'ĭl). Producing no crop; barren; unfruitful.

strychnine (strĭk'nĭn or nēn). A very poisonous substance, having a bitter, acrid taste, used in medicine as a nerve stimulant.

stunted (stŭnt'ĕd). Dwarfed, undersized.

suburban (sŭb-ûr'ban). Of or pertaining to an outlying part of the city, or to a smaller place immediately adjoining the city.

suction (sŭk'shŭn). The act of sucking; the process of drawing in.

sulphite (sŭl'fīt). A salt of sulphurous acid.

sulphur (sŭl'fŭr). Often used to disinfect houses, books, etc.

sweat (swĕt). The fluid which is given out from the skin when one is heated; perspiration.

T

tetanus (tĕt'ȧ-nŭs). A painful and usually fatal disease, resulting generally from a wound. When the muscles of the lower jaw are affected it is called *lock-jaw*.

thermometer (thĕr-mŏm'ĕ-tėr). An instrument for measuring the amount of heat in the air or the body or in water or milk, etc.
tonsilitis (tŏn'sĭl-ī'tĭs). A disease of the tonsils.
tourniquet (to͞or'nĭ-kĕt). A device for stopping a discharge of blood from the blood vessels.
toxin (tŏks'ĭn). A poisonous substance formed in the body, in meat, and elsewhere.
tuberculin (tû-bĕr'kû-lĭn). A fluid containing the products formed by the growth of the tiny vegetable germ that is the cause of the disease called tuberculosis.
tuberculosis (tû-bĕr'kû-lō'sĭs). A disease, especially of the lungs, sometimes called consumption.

V

vein (vān). One of the vessels which carry blood to the heart.
venom (vĕn'ŭm). Poison, particularly the poison which snakes secrete and communicate by stinging or biting.
ventilation (vĕn'tĭ-lā'shŭn). The process of replacing foul air by that which is pure in any closed place.

W

welfare (wĕl'fâr). Prosperity; happiness; well-doing or well-being in any respect.
wigwam (wĭg'wŏm). An Indian tent.
windpipe (wĭnd'pīp'). The passage for the breath from the larynx to the lungs; the trachea.
wriggler (rĭg'glĕr). The young of the mosquito.

Y

yellow fever (yĕl'lō). A contagious fever of warm climates, produced by the infection from the bite of the Stegomyia mosquito.

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